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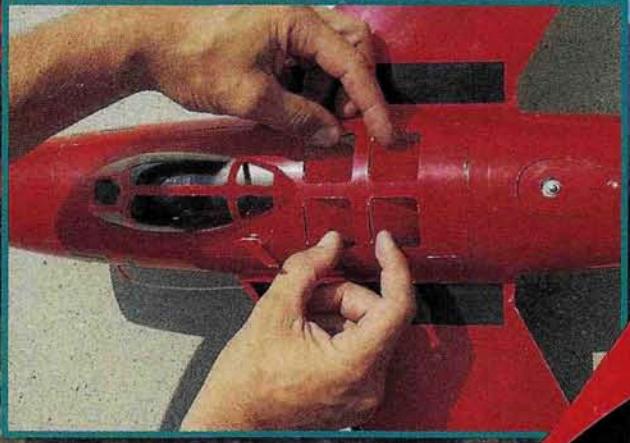
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INSIDE:

Learn how to
Build from Scratch!

MODEL AIRPLANE NEWS

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EDITORIAL

by TOM ATWOOD

Congratulations to our R/C Airplane "Sky High" Sweepstakes contest winners: Harold Durheim of Prairie, KS (\$3,000 value Grand Prize), Phillip Cathey of Crown Point, IN (\$1,000 value, 1st prize), Mike Lentes of Dowling, MI (5-year subscription, 2nd), and Pedro Valentin of Washington, DC (Air Age R/C books, 3rd).

In this issue, we've bound-in a free, revised Plans Directory—our holiday gift to you. For newcomers to scratch-building, we've included the first of two articles by Dan Santich on the basics. A "Sporty Scale" special feature by Frank Tiano shows how the pros sheet foam-core wings.

Putting together an issue around a Plans Directory almost necessarily brings to mind the other side of the hobby—the recreational flying of ARFs or ready-built planes. It seems that a growing percentage of new



R/C pilots would prefer to purchase a ready-built that will get them onto the flying field quickly, without the construction so many of us enjoy. Some argue a change is taking place in the hobby, which is

purportedly evolving into a "mere recreational sport!"—but the strong interest in semi-kits and construction plans and the requests for sources of scale information expressed in our mail argues otherwise! The hobby seems to be flourishing on all fronts.

Any expansion in recreational flying—whether it involves scratch-built models, assembled kits or ARF models—will continue to fuel product development and provide a bigger constituency for the preservation of flying sites and frequency rights (there's strength in numbers). It may also help elevate the status of R/C sport flying in this country to the level it enjoys in Europe, where there seems to be a greater public awareness of—and respect for—the top R/C competitive fliers. This sounds like a win-win situation to me!—for plans builders and ARF fliers alike.

I've just returned from the 11th Annual Keystone R/C All-Electric Fly-In, Quakertown, PA, and the excitement was as intense as the proliferation of amazing electrics. Coverage of the KRC Fly-In is upcoming; and you can also look forward to our usual high-quality coverage of the Scale Masters, Southwest Fan Fly, Oshkosh and others!

If you're expecting to see the "Optimized Electric, Part II," in this issue, I have bad news: in a dive during a high-speed aerobatic run using a 200W FAI 05 cobalt, terminal flutter took out the linkages to both elevons. My flying wing made a beeline for the ground and ended up in a thousand splinters (sound familiar?). Having already invested scores of hours in this project, I wasn't about to give up. Stay tuned for a report on the performance of the rebuilt version utilizing computerized elevon mixing...

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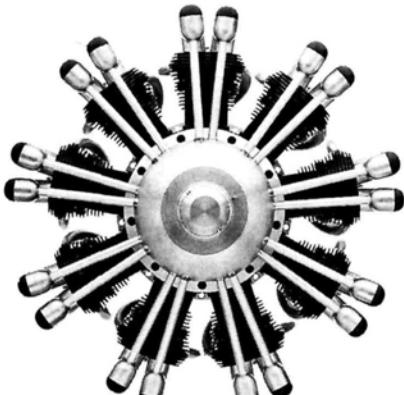
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AIRWAVES

WHERE TO WRITE TO US

If you're writing to the editors (and we'd love to hear from you), please be sure to address your letters to "Airwaves" Model Airplane News, 251 Danbury Road, Wilton, CT 06897. Only subscription orders and inquiries are handled by our Customer Service Department in Mount Morris, IL; other mail addressed there must be forwarded to Connecticut, and this leads to long delays.

THE PRESSURE'S BUILDING...

I commend the fine balance of subjects throughout MAN. Could you please tell me whether there's a model Steam Engine Association in the U.S.?

BILL PRUETT
Arkansas Pass, TX

Now, Bill, I imagine you're intent on building an R/C version of Langley's steam-powered Aerodrome. It has been done in free-flight, of course: in 1896, Langley's 25-pound, 1hp "Aerodrome no. five" flew over 3,000 feet at an average speed of 25mph. Now hanging in the National Air and Space Museum, it was made of steel and aluminum with silk-covered, wood-framed wings that spanned 13 feet, 8 inches. I think a modern steam-powered R/C plane (with a self-dowsing boiler?) would be a fantastic R/C project, if it could be done safely. If readers are interested in taking this one up, we'd love to cover it in these pages.

The association you're looking for is the International Brotherhood of Live Steamers, which you can join for \$1. Contact your regional secretary (there are three in the U.S.) listed in the monthly publication, "Live Steam." Its editor, Joe Rice, can be reached at P.O. Box 629, Traverse City, MI 49685. TA

CHOPPER SCHOOL

I'm responding to your inquiry about the X-Cell 30. Recently, I've had some experience with one. In June, I attended Ernie Huber's Flight Training Center in Crescent City, FL. Ernie

teaches his basic class using X-Cell 30s. The X-Cell can sure take a beating! Any helicopter that can take the repeated abuse that novice pilots dish out for 8 hours a day, 5 days running, deserves a gold medal. The kit seems very straightforward and is well-engineered. Even de-tuned for training, the X-Cell was responsive, yet stable. What could be better than that?!

I also recommend Ernie's school for anyone who's interested in R/C choppers. It's a great way to learn to fly one. You spend 5 days doing nothing but learning to fly, and Ernie is a stickler for making sure you have a firm grip on the fundamentals. This has to be the best way to learn to fly successfully. If you consider the cost of rebuilding a helicopter after a couple of crashes, you'll see that the cost of the class is more than justified. I feel that the class put me at least a year ahead of where I'd be if I tried to learn on my own. (And who knows how many crashes the class has saved me.)

JOHN DELUCA
Brooklyn, NY

Thanks for your comments, John. The X-Cell 30 is manufactured by Schoonard and distributed by Miniature Aircraft USA, 2324 North Orange Blossom Trail, Orlando, FL 32804. Here's Ernie Huber's address: R/C Flight Training Center, P.O. Box 727, Crescent City, FL 32112. TA

LEAVING THOSE WHEELS BEHIND...

For the past couple of years, I've been racing R/C cars; not on a competitive level, but just around the neighborhood for fun. In July, I bought a copy of your magazine, and it really fascinated me because I

More Fun. Less Funds!

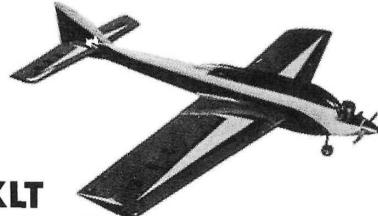


ESCAPE

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Wing Area	770 square inches
Engine Size	10 cc
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Wing Area	700 square inches
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Dealer Inquiries Invited

(Continued on page 10)

never knew that R/C planes and helicopters existed.

The reason for this letter is that I want to leave the ground for some flight time, and I have so many questions. Which plane should I start with? Which fuel should I use? *Can you help me?*

CHARLES NIMMONS, III
Philadelphia, PA

Chuck, you're in luck! There's a variety of excellent trainers from which to choose. (We've reviewed many of them in MAN.) You'll probably want one of the gentler trainers with enough dihedral to give it "self recovery" (i.e., a greater capacity to regain level flight with hands off the controls), and a flat-bottom airfoil combined with a relatively light wing loading (say, in the 15- to 20-ounces-per-square-foot range). These traits allow easier building and slower (therefore easier) flying. My own preference in beginner trainers is for bigger planes in the .40 to .60 range. They're easier to see and seem to handle with a little more grace (although many may think otherwise!).

Here are three of the many beginner kits I can recommend (no slight intended to the many high-quality manufacturers not represented!):

• **Goldberg Eagle 2** (Carl Goldberg Models, Inc., 4734 West Chicago Ave., Chicago, IL 60651.)

• **Telemaster 40** (Hobby Lobby, 5614 Franklin Pike Circle, Brentwood, TN 37027.)

• **Great Planes PT 40** (Great Planes Model Distributors, 1608 Interstate Dr., P.O. Box 4021, Champaign, IL 61820.)

If you want to learn to fly an electric, a beginner-level glider provides an excellent starting point. Although gliders can be slightly trickier to handle than many of the slower, glow-powered trainers, they're an excellent first step. Recommended models in-

clude the Goldberg Electra, the Airtronics Eclipse and the Astro Challenger.

You might be interested to know that there's a publication whose sole purpose is to rate basic trainers and convey the fundamentals of successful R/C flight training: "Ease-of-Flying Ratings" is published by Jim Waterman, 3818 Deerfield Dr., San Antonio, TX 78218. Its introduction discusses the model characteristics that are linked with good trainer performance.

As for fuel, any popular brand with a nitro mixture of 5 to 15 percent is recommended. There are various schools of thought about whether to use castor oil, synthetic, or a combination—give your local flying club a call, and hook up with one of its members to get some input. You'll learn to fly much faster with the assistance of an experienced flier, and most R/C pilots are happy to support the hobby by helping newcomers to get started!

Also, check out our books for beginners: "Learning to Fly Radio Control Model Airplanes" and "Building Your First Radio Control Model Airplane"—both by John Carroll.

TA

SCRATCH-BUILDING

I'm 13 years old and very interested in scratch-building. I think your "Plans Mart" is great, but most of the planes are of the trainer type and for beginners. This is great, but I wish you'd publish more construction articles of scale and more complex aircraft like the SB2U-1 Vindicator. I'm curious about how you choose the aircraft for your construction articles. I've heard that you have competitions. If so, when

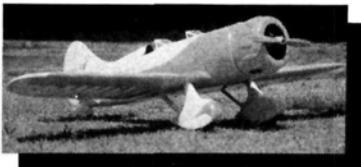
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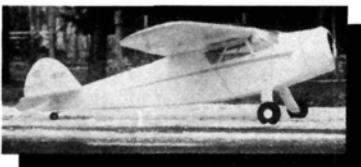
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AIRWAVES

(Continued from page 9)

or where?

I've been searching for plans or kits of the Ryan/North American Navion, but without success. I have plenty of info on it (including my Dad's full-scale Navion). I hope some of your readers can help! Also, I'm looking for a four-blade prop that will look right on a .40-size P-51.

You're doing a great job on the magazine. I hope someday I'll have enough money to subscribe, but, with my allowance, it's doubtful.

MICHAEL DICKERSON
Dayton, OH

Michael, let me go from the specific to the general. Plans for the Navion are available from John Pond's Old-Time Plans Service, P.O. Box 90310, 253 N. 4th St., San Jose, CA 95109. If scale three-views are helpful, you can get them from Scale Model Research, 2334 Ticonderoga Way, Costa Mesa, CA 92626. Of course, if your dad owns one, you can measure it and scale it down yourself. (Chris Chianelli, our associate editor, suggests that you throw the full-scale plane into the dryer—wet!). For the four-blade prop, you're probably best off carving it from balsa for display.

As to the construction articles, we try to offer a variety without putting too much emphasis on any one type of aircraft or era, because this has the greatest appeal to the widest readership. We also keep an eye out for the new and unusual, and for evolving construction techniques, so don't be surprised if you see some novel designs incorporating composite construction along with the usual built-up projects! Nearly any accomplished modeler who's capable of creating and flying an original R/C model—and ironing out the bugs!—can contribute a construction piece (specialized projects like those on scale aircraft, ducted fans and advanced electrics require appropriate expertise).

So, enterprising hobbyists who get bitten by the bug to produce a new design or plans set have a lot to do with the construction articles we print. Readers who are interested should give me a call or write!

As to the allowance, the best I can do—and, given your level of interest, it's appropriate—is to give you a free 6-month subscription to help get you started in a great hobby.

TA

PYLON RACING FORMULA ONE

I was delighted to read Jerry Nelson's September article: "Racing Renaissance—Return of R/C Goodyear." In the early '60s, my brother and I were quite active in control-line speed and team racing. I was the builder/helper, and he was the pilot. A couple of years ago, I went back to the hobby; this time, I joined the R/C legion, and after building an Eagle II and a Big Stick 40 (and learning to fly, which wasn't that easy!), I tried to find material on pylon racing, which, to me, was a logical evolution. To begin with, the only magazine that has a monthly column on pylon racing is *Model Aviation*, which covers mostly fast-times and technical topics that don't help me at all. After finding out the price of the type of engine one needs to be competitive in pylon racing Formula One (plus the cost of the plane and all the "indispensable" miscellaneous items), I dropped the whole idea. Besides, I belong to a very nice R/C club in which we're all trying our best to control noise, fly safely and have fun. How can I expect to own and fly a "hot" Formula One pylon racer in such an environment?

After reading Jerry's suggested rules, I think that there's quite a po-

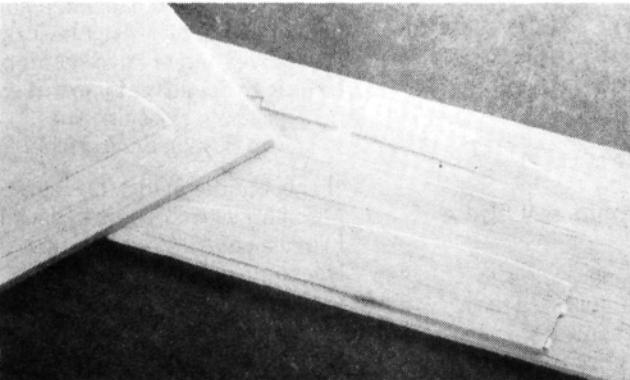
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HOW TO:

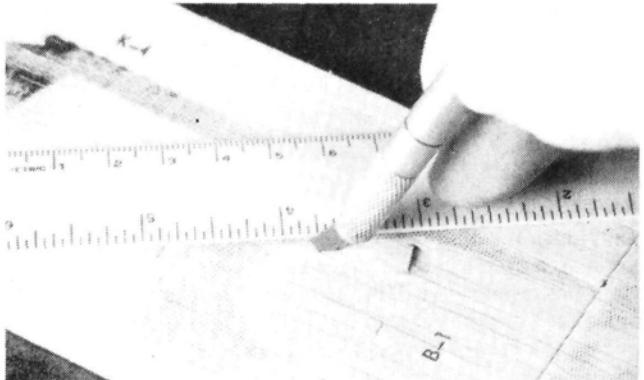
REMOVE DIE-CUT PARTS

by RANDY RANDOLPH

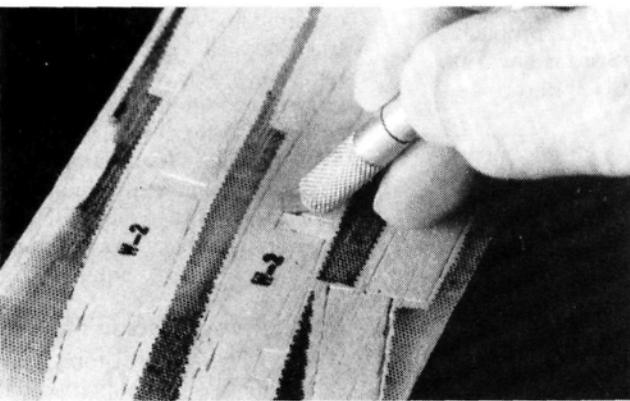
Most kits have either die-cut or machine-cut parts (e.g., wing ribs, formers and surface outlines), which simplify building. Machine-cut parts are easy to work with, but the way in which you remove die-cut parts from their backing sheets can affect their quality. The photos show you how to do it properly.



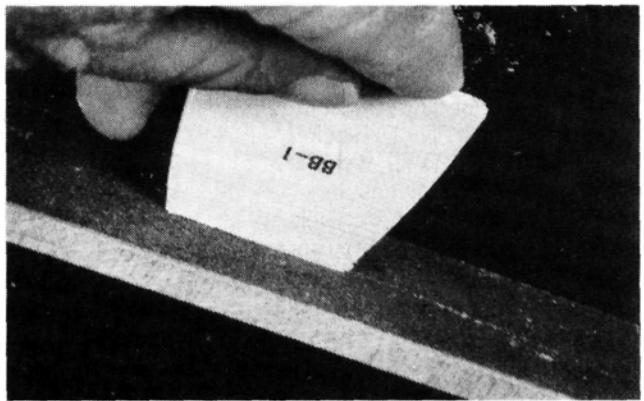
1. So that the parts will remain in the sheet, small parts of their outlines are left uncut. This facilitates handling, but the wood can splinter when the parts are removed.



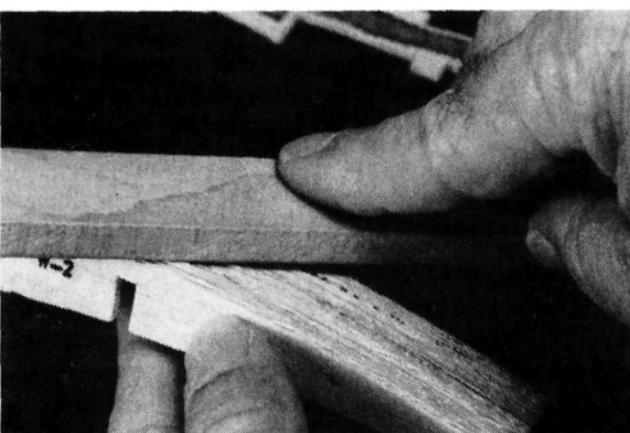
2. Don't push the parts out of the sheet; instead, cut them out with a razor knife, and cut all the straight sections with the aid of a straightedge.



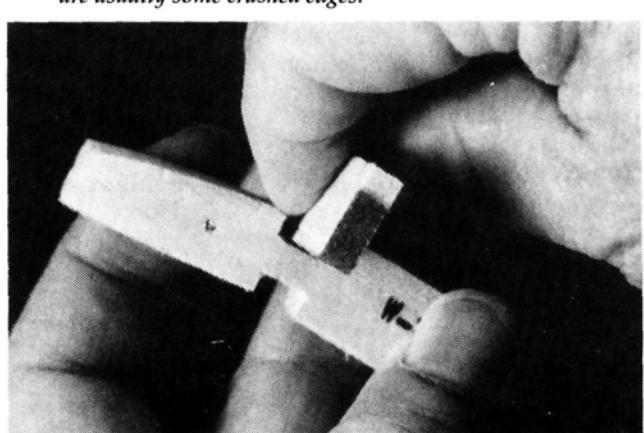
3. Before cutting the ribs and formers from the sheet, cut out and remove the notches. This helps to prevent splitting.



4. After you've removed a part, sand its edges. To minimize crushing, wood is usually die-cut when it's wet, but there are usually some crushed edges.



5. Pin the ribs together and sand them all to the same outline. In the case of a tapered wing, sand the corresponding ribs in each panel simultaneously.

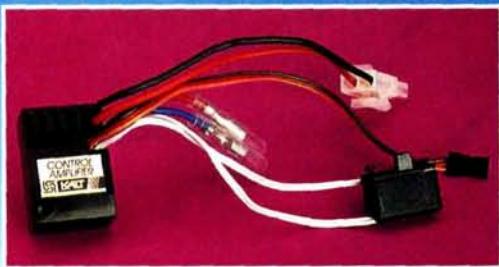


6. Spar notches tend to be "crushed" more than parts that are cut with the grain. Clean them with a piece of spar stock that has a strip of sandpaper glued to one edge.

AIR SCOOP

by CHRIS CHIANELLI

Whether it's products, or people behind the scenes, my sources have been put on alert to get the scoop! In this column, you'll find news info that will, at times, cause consternation, and telepathic insults will be launched in my general direction! But who cares?—it's you, the reader, who matters most! I spy for those who fly!



550 AMPS AT 1.34 OUNCES

Kalt's new Control Amplifier is an electronic speed controller that's specifically designed for electric helicopters like the Kalt Whisper. Weighing only 1.34 ounces (36 grams), it's likely that fixed-wing electric-flight fans will welcome it, too. Kalt claims that this "advanced Mosfet-technology" unit

will handle up to a 550A maximum. The controller has a safety motor-start switch to prevent full throttle from accidentally coming on when the radio is on.

Using eight, Sanyo, N-1100mAh, SCR cells (as shown in the new Kalt Whisper battery pack), here's a battery that's rated at 9.6 volts and only weighs 1.75 ounces more than a standard 1400mAh SCR 7.2V pack. Kalt's pack (no. K40002) is one of the first to become widely available in hobby shops.

Advances in cell technology are coming faster than ever—keep a watch on this department!



9.6V PACK ONLY 1.75 OUNCES MORE



PLETTENBERG VS. ASTRO 60 ELECTRIC WORLDS

At the F3E World Championships, two motors made their presence well known: the European Plettenberg HP 355 and the FAI Astro 60, which helped the American team take a strong second place. Both motors can accept up to 2,000 watts of input power in normal use. The Plettenberg weighs 23.6 ounces; the Astro, about 22 ounces.

The complete Plettenberg line will be available from Hobby Lobby, as will the Swiss-made Sommerauer speed controller, which is currently the mainstay of the 27-cell event. The American team used the new Astro 205 speed controller (see "Product News"), and were overheard talking about its slight climb advantage. I wonder what the Europeans were saying! (For size comparison, the third motor shown is a standard Mabuchi 540.)



FROM INDY WITH REV'S

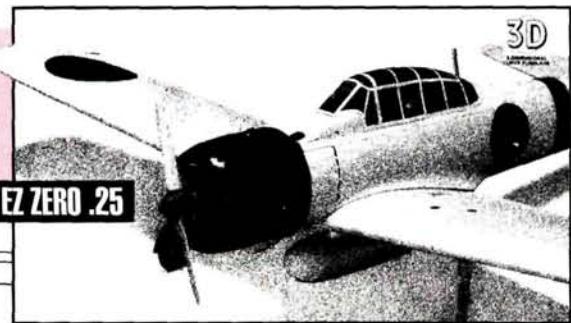
In the near future, it's quite possible that the 1/2A speed-demons' world will take a turn for the "faster!" A new company, BV Competition Engines, (owned and operated by Fred Baldwin and Jim Van Arsdall—designers of full-scale engine components ranging from small turbines to Indy 500 parts) is introducing the .050/.061 Shuriken engine.

Instead of being die-cast, this engine is machined of bar stock 2024-T3 aluminum. Its liners are ABC or AA ceramic, and its pistons are machined from forged, high-silicon, aluminum-alloy bar stock (the same materials that are used for Indy car liners and pistons). Furthermore, the wristpin (not the usual balljoint), rod and crankshaft are machined of heat-treated steel.

The crankshaft rides in Grade-7 ball bearings, and the company claims that this engine has achieved 29,000rpm using 50-percent nitro with a 5x3 prop; and 32,000rpm using 70-percent nitro with a 5.5x5 single blade. Unconfirmed circuit reports have this little red devil turning between 40,000 and 45,000rpm using a tuned pipe. Because the Shuriken is designed and manufactured using CAD and CNC turning and milling centers, these rpm claims might be more than rumors. This year's competitions will tell!

Sports Aviation, the EZ kit manufacturer, offers a .25-size Mitsubishi Zero that's finished in a carrier scheme. It's currently available overseas, but there's no word yet about its potential availability in the States, or whether a .40 size is in the works.

CARRIER SCHEME EZ ZERO .25



PILOT PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING!

\$END IN YOUR SNAPSHOT\$!

MAN is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable.

All photos used in this section will be eligible for a grand prize of \$500, to be awarded at the end of 1990. The winner will be chosen from all entries published, so get a photo or two together plus a brief description and send it in!

Send those pictures to:
Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.

"SHARP" ENFORCER

F. Duayne Sims made this hot-looking Enforcer from a Balsa USA kit. Covered with MonoKote and powered by an O.S. .90 FS engine, this red, yellow and black beauty flies fast and true, and it sure looks like a dangerous fighter. With that highly modified fuselage nose, fliers out in Soda Springs, ID, should "check their six" often; this Enforcer is really sharp!



"HOW WOULD HUGHES FLY?"

This Hughes 500D helicopter with a 58-inch rotor span belongs to Larry Moore (Tucson, AZ). He uses an O.S. 61 SFN engine with a Magna pipe for power, and he controls it with a Futaba 7-channel radio and gyro and functional RAM navigation lights. Larry scratch-built the fiber-glass tail assembly and landing-gear struts, and he painted this gem with a hot-pink, acrylic-enamel base, fluorescent-pink pinstripes and a clear finish. The fuselage is by H&C, and the mechanics are King Cobra by GMP. This is one classy chopper!



channel radio and gyro and functional RAM navigation lights. Larry scratch-built the fiber-glass tail assembly and landing-gear struts, and he painted this gem with a hot-pink, acrylic-enamel base, fluorescent-pink pinstripes and a clear finish. The fuselage is by H&C, and the mechanics are King Cobra by GMP. This is one classy chopper!



THE MAGICAL MYSTERY SHIP

Peter Lomanto took some of the mystery out of scale models when he built this Travel-Air Mystery Ship. It was his first attempt at a close-to-scale plane—and what a plane it is! Peter finished this "Golden Ages" kit model with an acrylic-enamel spray paint, lime-green pinstripes and a clear coat of polyurethane—bright and shiny! Although Peter hasn't flown it yet, when he does, he's sure it will soar with an Enya 120, 4-stroke engine with a gear pump!



BEGINNER'S LUCK?

This sleek Carl Goldberg Mirage 550 Electric Sport Trainer was George Sammond's (Bloomsbury, NJ) first R/C project! Covered with a cream MonoKote, this 54-inch-span beauty weighs 46 ounces and is 39 inches long. George uses a Motor Turbo 550 and a Futaba Attack with speed controller to fly this 3-channel plane. He reports that it, "flies extremely well." That's a good indication that George is skillful as well as lucky!





ALLEN'S FIRST JET

This Byron F-16 must be the product of a veteran modeler, right?—wrong! Before Allen Rubin of Ft. Lauderdale, FL, built this jet, he had only built two other models, and neither was a jet. What about the great paint job? Allen must have a lot of experience in this area. Wrong again—he had never painted an airplane! He's still learning to fly his trainer, but if he's as good in the air as he is in his workshop, his jet will be burning up the skies in no time.



GREAT GRUMMAN

A Grumman Gulfhawk is a difficult project, but James Anderson of Prattville, AL, was up to the challenge. He scratch-built this 1/4-scale biplane of balsa and plywood, and he finished it with Randolph butyrate dope. James didn't skimp on the details, either: notice the sliding canopy, the cowl's handmade rocker-arm blisters and the cabane/interplane struts that must have been hand-forged of brushed aluminum. There's even a home-built mechanism that makes all three landing gears retract! The plane weighs 38 pounds and is powered by an A&M Sachs 4.2ci engine. This Gulfhawk looks so realistic that you feel as if you could jump right in and take off!



EUROPEAN STYLE

This semi-scale model of a 1937 German aircraft is a tribute to European styling and engineering! William Temple (Tucson, AZ) built this Focke-Achgelis-61 Autogyro from plans, and he flies it with an O.S. 40 FP and a 3-channel radio. The counter-rotating free rotors don't use any power, but they provide extra lift in a way that's usually associated with gyrocopters. In flight, this plane clearly says "Achtung!"



MARTIN MARINER MARVEL

This is Ed Zemaitis (Harrisburg, PA) behind his scratch-built Martin Mariner PBM-5A amphibian. This 1/12-scale, 28-pound beauty has a wingspan of 118 inches and uses two 4-stroke Saito 80 engines. The scale retractable landing gear is a construction feat in itself, and check out the compound curves in the fuselage, aft from the trailing edge.



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AIRWAVES

(Continued from page 10)

tential in this new category, and I'm enthusiastic about it. I also think that the "Schneider Cup" category would benefit from a similar approach. I think that anyone who strives to make our hobby more accessible and enjoyable to a large number of people rather than a select few deserves sincere congratulations. So, Jerry Nelson, here are mine!

JAMES C. VAN DOOREN
Fort Lauderdale, FL

Thanks for the letter and your comments, which were duly noted, James.

TA

WE FOUND THE WALRUS...

Mr. D.J. Asher asks (August '90 "Airwaves") for help in locating the drawings for the British amphibian known as the "Walrus," so he can get his 4-stroke radial into the air. Argus Specialist Publications (Argus House, Boundary Way, Hemel Hempstead, Hertfordshire, HP2 7ST, England) has excellent drawings for the Walrus in 1:8 scale, with a wingspan of 69 inches (175cm), foldable wings, and all the details he'd want for a .60 engine (drawing no. RM 164; price: approximately \$15.75).

It can also be handy to have the drawings from Scale Models Plan Services, Battle of Britain Scale-Drawing Collection (plan No. 2659, in 1:48 and 1:72 scale). They'll surely take care of Mr. Asher's order.

KJELL MASCH
Oslo, Norway

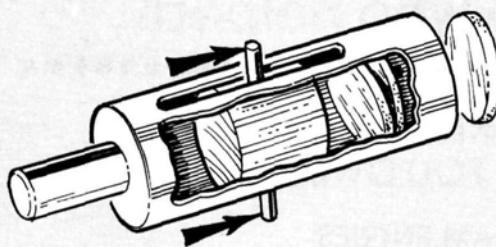
Thanks, Kjell!

We welcome your comments and suggestions. Letters should be addressed to "Airwaves," Model Airplane News, 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

HINTS & KINKS

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman, c/o Model Airplane News, 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH. PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.

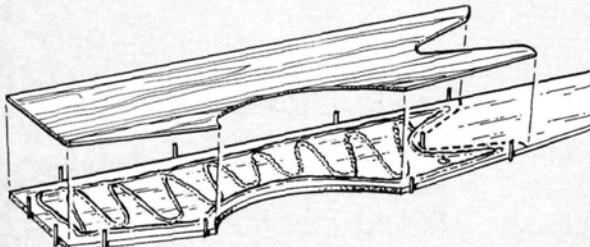
by JIM NEWMAN



HOLLOW-PUNCH SCRAP REMOVAL

The next time you make a tubular punch (e.g., for use in a drill), slot the sides, fit the dowel piston and insert a wire cross-pin. To remove the scrap discs, simply press down on the ends of the pins with the open jaws of pliers.

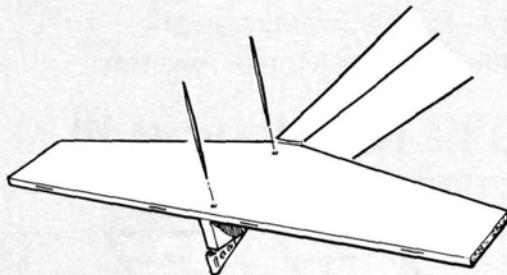
Roland Noble, Dundas, Ontario, Canada



GLUING GUIDE PINS

With some glues, you have only one shot at placing doublers correctly! Assemble the doubler and fuselage side dry (i.e., without glue), make sure everything is properly aligned, and place T-pins or headless brads around the parts, as shown. Remove the doubler, coat the area with glue, and slide the doubler back down between the pins. This ensures correct alignment the first time!

Michael Rogers, Las Vegas, NV



TEMPORARY STABILIZER ALIGNMENT

Try this trick before final assembly and gluing. Make sure the stabilizer is properly centered and aligned, hold it firmly, and drill small holes through to the saddle. Now you can remove the stabilizer for covering, etc., and be confident that, when you glue it and drive in toothpicks or tightly fitting dowels, it will be properly aligned.

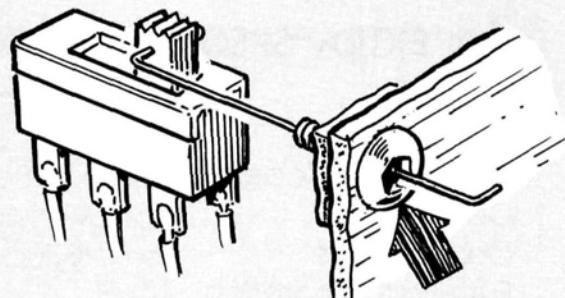
Clarence McCarthy, Oxford, MA



CARBURETOR DUST EXCLUDER

It's important to keep dust out of your carburetor. After flying, treat your engine with after-run oil. Then roll up an inexpensive, foam, ear plug (available at airports and sporting goods stores), and push it into the carburetor venturi.

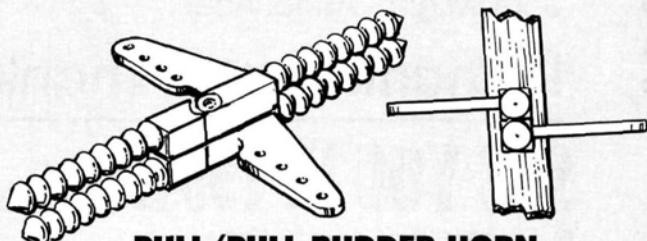
John Trundy, Newport, ME



SWITCH-ROD GUIDE

Don't throw away sheared-off 1/4-20 nylon wing bolts! Drill a no. 52 hole lengthways through one and a 13/64-inch hole through the side of your plane's fuselage. The bolt makes a neat escutcheon and bushing for the switch rod. Remember to glue a small "scab" of plywood inside the fuse for the bolt to thread into.

Art Major, Tarzana, CA

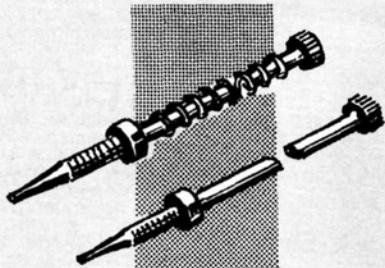


PULL/PULL RUDDER HORN

Here's a compact way to avoid making a double-ended horn. Drill the control surface and fin, and then install two Robart Horn Hinge Points, one above the other. The slight difference in their heights isn't noticeable and won't affect the control geometry.

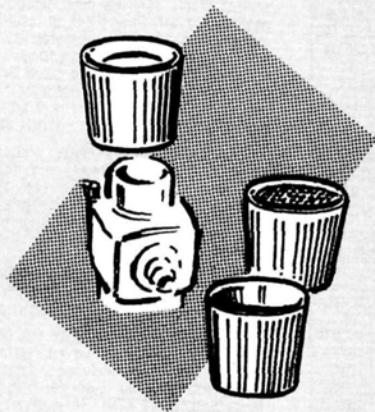
Gary Hueser, Ellisville, MO

HINTS & KINKS



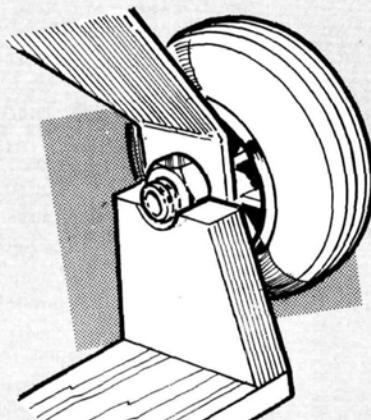
FLEXIBLE NEEDLES

To make a needle that won't break, cut through the needle stem and solder a ball-point spring between the halves. You can make superb flexible extensions in the same way, using coiled, expanding curtain wire.



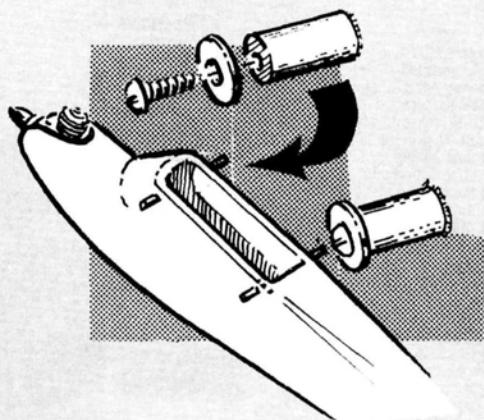
NEW USES FOR TOOTHPASTE CAPS?!

A toothpaste-tube cap can serve many functions! Use it as a between-flight intake dust cover; remove its center and glue in fine mesh to make a filter; or use it as an intake extension for a cowled engine (it should fit snugly).



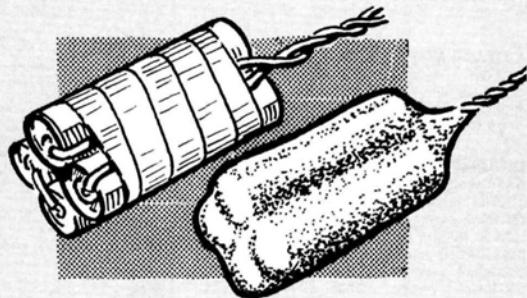
PREPVENT FLATS

When you park your model in the sun or the shop for a long time, its tires may flatten. To avoid this, raise the wheels off the ground on these axle stands, and make one for the tail wheel, too.



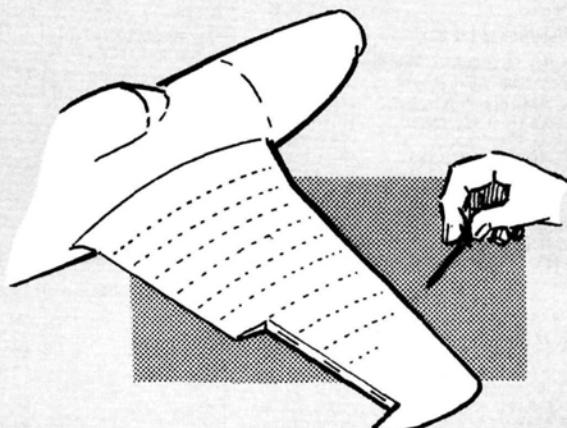
RUBBER-BAND SECURITY

To prevent oily rubber bands from slipping off accidentally, install a washer that's slightly larger than the dowel, as shown.



BATTERY-PACK PROTECTION

To protect your battery pack, bind the cells and leads securely with masking tape (not vinyl). Then dip the pack in a plastic-dip compound (e.g., Plasti-Dip, which is used on tool handles) that's available from hardware and auto-parts stores. Be sure to test the pack thoroughly before dipping.



SMOOTH COVERING

For a smooth covering job with MonoKote, etc., prick sheet balsa with a large T-pin. This prevents the formation of bubbles by allowing trapped air to escape from below the film, and it won't weaken the structure. To provide air to the center-section cutout, make a hole or two in each rib.



■ A Zero lining up for a belly shot on a Corsair.





■ Far left to right: Byron's latest—a 27-percent-scale Russian Sukhoi—is forgiving but aerobatic. 20 pounds, 82-inch span, Saito 270 4-stroke.

■ Yellow Aircraft's model of the 5,000th full-size Phantom. An ARF with plug-in wings, an O.S. Max .91 and a Dynamax fan, it comes finished as shown.

■ This quarter-scale T-6 Texan was built by Art Charlesworth of the IMAA and flown by 17-year-old Danny Williams. It has a Sachs 4.2 and a C&H ignition.

■ Steve Schlachta of Aeroloft Design built this F-4 Phantom from a new Yellow Aircraft kit.

B Y R O N

I MAGINE THAT
YOU'VE died
and gone to
heaven: you
awake to find
yourself surrounded by
airplanes of every con-
ceivable size and

shape, flying through a balmy sky or parked on the ground. Now, you have a picture of Byron Aviation's annual Expo! This year, over 50,000 people combed the verdant Iowa countryside in search of motel rooms and campgrounds just to attend this extravagant celebration of powered flight.

WRITTEN AND PHOTOGRAPHED BY ROB WOOD

AVIATION EXPO '90

Incredible models, precision flying and a dazzling pyrotechnic extravaganza



BYRON EXPO



In the heart of the nation's corn belt, the town of Ida Grove might seem an unlikely place for such an onslaught of airplane enthusiasts and their flying machines. (The nearest town with commercial-airline service, Sioux City, is more than 60 miles away!) One man is responsible for transforming this sleepy little farming commu-

nity into a bustling manufacturing center—Byron Godbersen.

After developing a prosperous hydraulic-lift-and-trailer factory in town, Byron turned his attention to one of his great loves—airplanes. After watching a demonstration of R/C flying in 1977, he became fascinated by the idea of large-



■ Left: Robert Hahn's gorgeous 1/16-scale MiG-15.

■ Below: Hahn's MiG-15 flies by at 65mph.

1/6-SCALE MiG-15

SPECIFICATIONS

Type: 1/16-scale MiG-15
Wingspan: 24 inches
Length: 27½ inches
Weight: 25 ounces
Wing Area: 110 inches
Wing Loading: 32.7 ounces per square foot
Power Req'd: Cox TD .09 (control-line engine modified for a throttle sleeve)
No. of Channels Req'd: 3 (nose wheel and ailerons, elevator, throttle)

DID YOU EVER WANT to try your hand at scale jets, but were a little intimidated by the expense, hassle and sheer size of the things? How about one you can hold in your hand or pack neatly in a small suitcase?

I saw a 24-inch-wingspan MiG-15 at Byron's Expo '90 and fell in love with it—as did a few thousand other people! This model captures the hard work, skill and determination that was typical of the modelers who flew at this year's event. The technology and scratch-building techniques were ferreted out by a man who



isn't even in the model manufacturing business! By trial and error, he was able to come up with a beautiful model that had the crowd's attention riveted on every pass. I interviewed Robert Hahn (of Costa Mesa, CA), and I'll let him describe the techniques he used to create this great-flying crowd-pleaser:

"I chose to build the MiG-15 because the fuselage was basically round and symmetrical, and the [fiberglass] plug could



scale flying models. He hired a few people to try out some new ideas, kitted a Pitts Special in 1979, and Byron Originals was born. Today, it's perhaps the largest manufacturer of scale WW II and modern warbird models in the world! The two plants in Ida Grove now employ more than 500 people, and new Byron models appear on hobby-

shop shelves with amazing regularity.

Aviation Expo gives Byron an opportunity to demonstrate his high-quality products, and it provides a meeting ground where modelers and full-scale aircraft enthusiasts can immerse themselves in aviation for five full days.

Full-scale aircraft fill the sky from morning till

■ Far left to right: Byron's demonstration P-51— $\frac{1}{5}$ scale; 22.5 pounds; Super Tigre 3000; smoke nozzles on wing tips.

■ This Byron 85-inch span F4U-1 Corsair is powered by an A & M 4.2ci engine.

■ Byron's new Bullet—a non-scale sport jet touches down. It weighs 9.25 pounds, has a 42-inch span, and uses a Byro-Jet ducted fan with an O.S. .91.

■ Bob Violett's new F-16 has a Viojet fan, a KBV .82 engine with new articulated retracts, lots of space-age materials and a pre-molded wing and tail.



be made on my lathe. "The fuse is fiber-glass, with conventional built-up wings and tail surfaces, and a Sig 'generic' canopy. I'm not a fiber-glass technician by trade, but I learned it by hanging around Jet Hangar Hobbies and talking to Larry Wolfe."

"The fan blade and fan-engine mount are scratch-built, as is virtually every other part of the airplane. The fan blade is composed of five 7x7-inch Zinger props that were cut down, thinned and glued together like pieces of a pie. There's an aluminum ring on the rear, and a plate on the front of the hub, which also serves as a pulley for belt-starting."

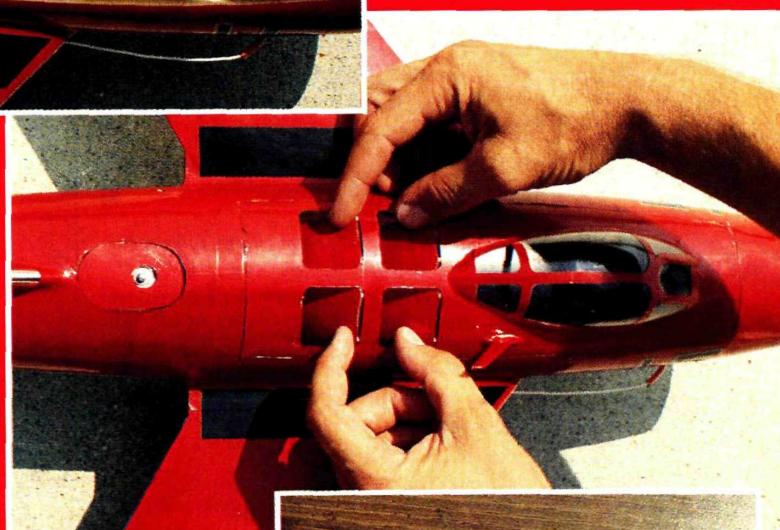
"The vents on the top of the fuselage are functional, and they keep the engine cool by opening

■ Left: Crowded, but efficient. ■ Middle: The builder demonstrates his diminutive creation's working air vents. ■ Bottom: Robert Hahn's prototypical fan unit.

under pressure of the air moving over the fuse during flight.

"The fuel system is pressurized for high performance, but this initially caused the .09 to idle too rich. I had to design a small pincher, which pinches off the fuel line and diverts the fuel to a second needle valve for idle-mixture metering. "It has been clocked at 55mph with a 10mph headwind, so I assume its top speed is around 65mph. Being as small as it is and weighing only 1½ pounds, it's a handful to fly, but not too bad. Landings are tricky—[they're]

relatively easy on grass, but [the MiG] has a tendency to bounce on hard surfaces and 'endo,' which causes minor damage; but it's still a lot of fun to fly"—and lots of fun to watch, too!



BYRON EXPO



■ Hurricane Cobra in flight. Built from a Hurricane Fans kit, it has a Hurricane 6-inch fan unit and a Rossi .90. Owner Steve Corning says its top speed is 180mph—over 200mph in a dive!

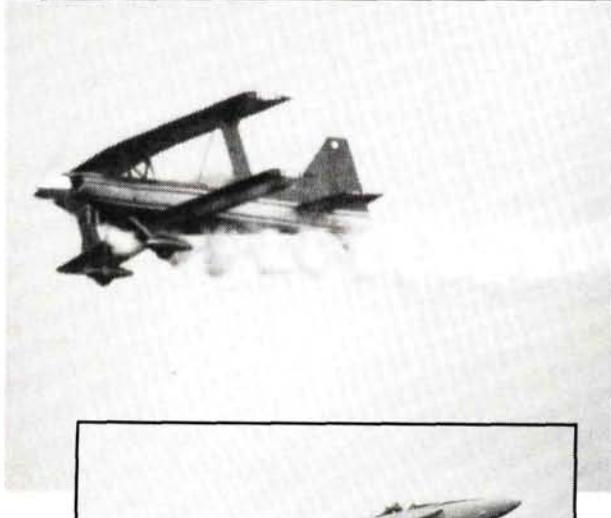
night! Full-scale and R/C air shows run constantly, punctuated by world-class demonstrations of precision flying, aerobatics, skydiving and aerial comedy acts. Byron's 1/5-scale re-enactment of the Battle of Midway—"Striking Back"—

tops off each afternoon, and somehow, they manage to devote several hours a day to open R/C fun flying!

Over 300 registered pilots brought more than 500 beautiful scale flying models to this year's Expo, and the air was filled alternately with jets and prop planes. A few photographs can give you a taste of the quality of these models and the immensity of the spectacle, but if you really want to get the full impact, attend next year's Expo. Your life won't be the same afterwards! ■

▲ An Ultimate Bipe (owner unknown) in a close-in flyby.

◀ Kenny Bryan, test pilot and master Byron builder, tears holes in the sky with a Byron F-18 Hornet powered by an O.S. .91.



■ Above: Built from a Sterner kit, Bob Hiller's F-80 roars into the sky. It uses a Rossi .81 engine, a Byron fan unit and Rhom-Air retracts.

■ Below: Dennis Crook's 23-pound Yellow Aircraft SR 71 lifts off. It has been clocked at 160mph!



■ Left to right: Debbie (one of the few female pilots at Expo) polishes a 10-year-old Waco built by Larry Scott. The plane weighs 35 pounds and is powered by a Kawasaki 3.5ci engine. ■ Byron's 10-foot-long SR71, with 6-foot span, two O.S. .91 engines and a Spectra 7 radio. Flown for Byron by Carl Spurlock, who said it was "...like driving a bus." ■ Carl Spurlock and Byron's "Bullet"—a non-scale sport jet.

SUPERFORTRESS DOWN, FLYING FORTRESS UP!

AT LAST YEAR'S EXPO, spectators saw the demise of the world's largest flying model of a B-29 Superfortress. Radio failure was the probable villain, but investigations have proved inconclusive. Those of us who mourned the loss can take heart, though—it

looks as if Byron Originals will have a replacement ready for next year!

Those who had hoped to see a giant bomber flying at Expo '90 weren't completely disappointed. After "Striking Back," the Expo crew wheeled out what I'm sure is the world's largest flying model of a B-17 Flying Fortress! With Byron project engineer and test pilot Kenny Bryan at the controls, the 250-pound bird rolled smoothly down the runway and lifted effortlessly into

the blue Iowa sky. A ship that large and that beautiful roaring past and



climbing out over the green hills was truly an awesome spectacle—one that I hope you'll all get a chance to enjoy. ■

SPECIFICATIONS

Type: B-17, Experimental
Span: 20 feet
Weight: 250 pounds
Power Required: Four A&M 4.2c.i. gas engines with C&H ignition; Byron three-blade prop system.
No. of Channels Req'd: 7 (the usual four, plus retracts, flaps and bomb bay doors)
Features: Construction like that of Byron Warbird kits, e.g., it has a fiberglass fuselage and foam wings covered with layers of epoxy resin/glass-cloth. The model has custom-machined landing gear and inlaid panel lines and rivet details.



Since the first miniature re-creation of a WW II land, air and sea battle at Byron's 1984 Fun-Fly, the planners and crew have been continually challenged to create more sound, more fury and, above all, more realism! Byron Godbersen, himself a paratrooper in the war, has a strong sense of what works: watching and hearing "Striking Back" pulls you deep into the drama and gives you a taste of what war is all about.

As modelers, we admire the technology that produced the P-51 and the F-16, and we try to emulate that high degree of technical expertise in our own efforts. As humans, we deplore the awful toll on humanity these machines take when used for war.

Byron Godbersen shares this fascination and wants to create a drama that shows off the real-



■ Above: "Big Ben"—Fred Anderson's "baby"—fires 300 rounds of flak during the air battle.
■ Below: Les Fertig in the "Hornet's Nest" control center.



ism of his products, but will also teach young people that war is truly hell.

RECIPE: R/C SUPREME

Combine 52 pounds of black powder, 250 gallons of jet aviation fuel, 600 feet of high-explosive detonator wire and 12 sticks of dynamite. Add 11 large-scale model aircraft, and stir vigorously for approximately 45 minutes. Serves approximately 10,000 people!

That's just some of what it takes for

one performance of Byron's re-enactment of the Battle of Midway—"Striking Back"! More than 200 people put on the Expo every year, and many operate the airplanes, vehicles, pyrotechnics and all the other "moving parts" of the spectacle. Here's a glimpse behind the scenes at just how the Byron crew pulls it off:

During the battle, hundreds of rounds of "flak" fill the air. They're hand-loaded and launched by a device that's affectionately known by the crew as "Big Ben." A concert-quality sound system drives the sounds of a full-scale air battle through gigantic speakers.

A 1/5-scale model of the USS Hornet aircraft carrier, complete with operating anti-



■ Above: This Sherman tank is driven by a human operator. ■ Below: Byron driver at the controls of a PT Boat.



STRIKING BACK: GETTING BIGGER AND BETTER!



■ Far left to right:
Typical "bomb" used in show: black powder and detonator cord.

■ One of few women in the pyrotechnic field, Sheril Heilman plants charges for "Striking Back."

■ Electronic tank trip.

aircraft batteries and a hidden 50-caliber machine gun simulator, dominates the scene until a similarly scaled model of the Japanese carrier "Akagi" slips from behind an island and engages the American forces! Hydraulics are used to make the Akagi list after being bombed and torpedoed. Fighters are actually launched from the carrier by a nitrogen-powered catapult, which simulates the full-scale catapults of the era.

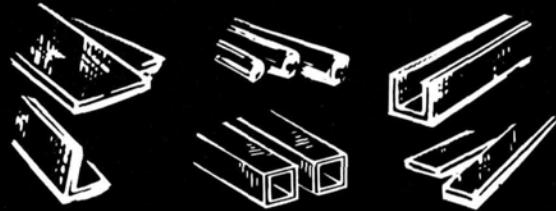
Explosions are produced by combining hundreds of feet of coiled high-explosive detonator wire with hundreds of gallons of jet aviation fuel. During the day—as full-scale air shows and open R/C flying go on just above their heads!—gutsy men and women plant these charges in strategic locations. Redundant banks of relays and miles of wire provide the sparks needed to ignite the jet fuel and powder on command—and the whole thing requires excellent hand/eye coordination!

Contrary to popular belief, the tanks and PT boats aren't R/C models; inside each one is a real, live person who must drive through the choreographed chaos! And if you thought all of those explosions, bomb drops and torpedo launches were synchronized by a computer system, you were wrong. The performance is just that—a performance.

All the individuals involved must be more than skilled technicians and pilots: they must also have a finely developed sense of theatrical timing and drama and be able to work as a team. When the cast and crew are "in the groove," the spectators are absorbed in the drama and transported to another time and place.

The unsung heroes of "Striking Back" are people like Fred Anderson and Sheril Heilman, who plant the charges; Les Fertig, who wires the electrical system; and Ron Latvag, who keeps things moving (or standing still). Kenny Bryan and all the other pilots, drivers and crew are to be congratulated for a great job! I wonder if they can top it next year! ■

K&S For Tubing



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ALUMINUM TUBE (12")

STOCK NO.	SIZE	PRICE EACH
100	1/16	.25
101	3/32	.30
102	1/8	.30
103	5/32	.35
104	3/16	.40
105	7/32	.45
106	1/4	.50
107	9/32	.55
ROUND BRASS TUBE (12")		
125	1/16	.30
126	3/32	.30
127	1/8	.30
128	5/32	.35
129	3/16	.45
130	7/32	.50
131	1/4	.55
132	9/32	.60
133	5/16	.65
134	11/32	.70
135	3/8	.75
136	13/32	.85
137	7/16	.90
138	15/32	.95
139	1/2	1.00
140	17/32	1.05
141	9/16	1.10
142	19/32	1.20
143	5/8	1.25
144	21/32	1.40
COPPER TUBE (12")		
117	1/16	.25
118	3/32	.30
119	5/32	.40
120	1/8	.30
SOFT BRASS FUEL TUBING (12")		
121	1/8	.40

RECTANGULAR BRASS TUBE (12")

STOCK NO.	SIZE	PRICE EACH
262	3/32 x 3/16	1.10
264	1/8 x 1/4	1.20
266	5/32 x 5/16	1.30
268	3/16 x 3/8	1.40

BRASS STRIPS (12")

230	.016 x 1/4	.20
231	.016 x 1/2	.30
232	.016 x 1	.50
233	.016 x 3/4	.40
234	.016 x 2	.90
235	.025 x 1/4	.25
236	.025 x 1/2	.40
237	.025 x 1	.70
238	.025 x 3/4	.55
239	.025 x 2	1.30
240	.032 x 1/4	.30
241	.032 x 1/2	.50
242	.032 x 1	.85
243	.032 x 3/4	.65
244	.032 x 2	1.60
245	.064 x 1/4	.60
246	.064 x 1/2	1.00
247	.064 x 3/4	1.25
248	.064 x 1	1.70
249	.064 x 2	3.00

SQUARE BRASS TUBE (12")

149	1/6 Square	.50
150	3/32 Square	.55
151	1/8 Square	.60
152	5/32 Square	.70
153	3/16 Square	.80
154	7/32 Square	.90
155	1/4 Square	1.00

BRASS STREAMLINE TUBE (12")

122	Small	.75
-----	-------	-----

SHEET METAL (4 x 10")

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251	.010 Brass	1.10
252	.015 Brass	1.50
253	.032 Brass	2.70
254	.068 Tin	.50
255	.016 Alum.	.50
256	.032 Alum.	.80
257	.064 Alum.	1.35
258	Asst Brass	1.30
259	.025 Copper	2.60

BRASS ANGLE (12")

171	1/8 x 1/8	.45
172	5/32 x 5/32	.50
173	3/16 x 3/16	.55
174	7/32 x 7/32	.60
175	1/4 x 1/4	.65

BRASS CHANNEL (12")

181	1/8	.55
182	5/32	.60
183	3/16	.65
184	7/32	.70
185	1/4	.75

SOLID BRASS ROD (12")

159	.020	.08
160	1/32	.08
161	3/64	.12
162	1/16	.20
163	3/32	.25
164	1/8	.40
165	5/32	.50
166	3/16	.80
167	.114	.40
168	.081	.40
169	.072	.25

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FLOATING AROUND

Schneider planning in high gear; Savoia S65 mystery solved?

by JOHN SULLIVAN

I'M WRITING this in early September, exactly two months before the second re-enactment of the Schneider Trophy Race at Lake Havasu, AZ. The Savoia Marchetti S65 that Mike Johnson and I are building has become an all-consuming pastime: it gobbles up our evenings and weekends—in fact, every spare hour. Similarly, "The Schneider Corner," which normally occupies part of this column, has consumed "The Floating Mailbag." I apologize to all who have sent letters and photos; I'll be back on course next time.

The chairman of the Desert Hawks and the Schneider event, Bob Martin*, is in high gear, and preparations are intense: booth arrangements have been completed; promotional material is on its way; entries are arriving steadily; a new frequency setup has been established; Lake Havasu's Nautical Inn (the event site) has been fully booked since mid-



Mike Johnson and John Sullivan display their Schneider entry—the Savoia Marchetti S65. It will be finished in red and silver.

August; and the Hawks are pacing the beach! Much remains to be done, but you can bet they know we're coming, and they'll be ready!

Before it's over, approximately 50 individuals and teams will have come together to compete. For the first time, working on the Savoia has given me a personal perspective on scale competition, and I'd like to share it with you.

IN THE BEGINNING

This all started when Mike Johnson walked up to Bob Hirsche's Scale Plans* booth at last year's Schneider meet. Mike told Bob that we were planning to build a Schneider for the '90 race (although I wasn't aware of this at the time!), and he asked Bob which he thought was the wildest Schneider of them all. Bob dug out a partially completed side view of the S65, and Mike was immediately sold on the project. Never mind that the Savoia was a push/pull, twin-boom demon that had killed the only pilot small enough to squeeze between its two 1050hp Isotta-Fraschini Asso V12s in trials before the '31 race! Mike wanted to build a Savoia!

Bob Hirsche returned to Buena Park, CA, completed the Savoia plans and sent

them to Mike. I was in my shop last December, looking over plans for the Short-Bristow Crusader (another Schneider entrant), when Mike walked in with the S65 plans, and the Short-Bristow was shelved indefinitely!

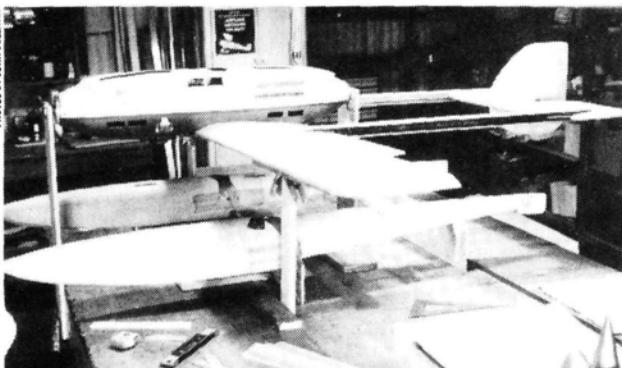
PROTO PROBLEMS

Other than planning and building the plane itself, much of our time has been spent wondering why the original crashed and why ours won't! This is important stuff! We know that the plane first flew in the summer of 1929, but it was kept out of the race that year because of cooling and "longitudinal control" problems. Now, 61 years later, we're wondering what happened.

We're told that the cooling problems were solved by covering the entire wing, excluding the flaps, with radia-



Mike Johnson slips a piece of sandpaper between the fuselage and the wing before permanently epoxying the saddle area.



Here, the pod and wings have been joined, and the floats have been "jigged" into place for float-gear installation.

tors. The pitch sensitivity continued, however, and it ultimately caused the death of the Savoia team's pilot, Dal Molin. We've studied Bob Hirsche's photos of the '29 and '31 Savoias. The modifications they made, and one curious item, may provide the clues we need.

The changes were apparently all made to the Savoia's tail group. Possibly to prevent them from whipping, a second brace between the float sterns and the boom was added. Other additions were a sub-rudder (to prevent yaw?) and a full-depth rudder (for more authority). The V12s on the prototype drove fixed-pitch metal props in opposite rotation, so you might think that torque problems were minimal, but if that was the case, why add more rudder? Dal Molin had flown the Macchi M33 in a previous Schneider race, so he was

no stranger to floatplanes, and his input must have counted heavily when alterations were made.

Whatever was done, and for whatever reasons, the changes didn't solve the problem, and this leads us to the aforementioned "curious item"—and much conjecture! One night, Mike came over and spread out our photos that show the Savoia sitting on the ground. He pointed out that, in every shot, the crews had either propped up the float sterns with saw horses, or had four to six mechanics sitting on the bow of the floats, which were supported with dollies at the step. Now, if the step was anywhere near the CG (the drawings show it very close), and the support dollies were at the step, and it took six guys to balance the Savoia, then one fact becomes apparent: the Savoia was terribly tail-heavy. If



Front-quarter shot of the Savoia S65 reveals struts, wire bracing and stern/boom V-braces. Spinners are custom glass lay-ups.

you carry this reasoning a little further, you could surmise that, when the engineers added struts and increased the rudder area on the 1931 version, they increased weight in the worst place imaginable, and the S65 was doomed.

Fred Constantine (our local first choice for information) agreed, and he also contributed the interesting fact that, despite the ability of early aviation engineers to design planes that rivaled anything by Burt Rutan in appearance, many were unaware of the importance, or even the existence, of CG relative to chord! Fred also suggested that the tank baffles in the floats might have been ineffective and allowed fuel to surge toward the stern on acceleration. Who knows? Because this is a scale event, we're stuck with the tail group on the drawings, but you can bet

there will be plenty of lead in the nose!

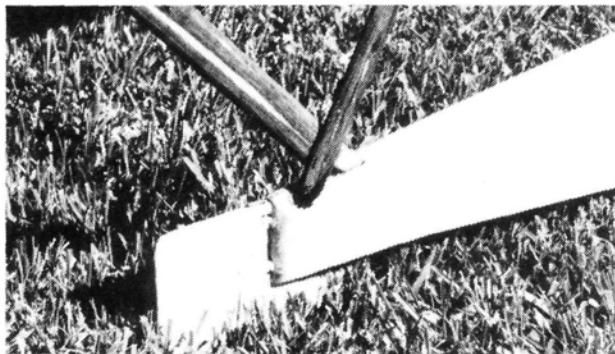
FINAL SPECIFICATIONS

As you can see from the photos, the Savoia is doing well: at 23-percent scale, it's 6 feet, 8 1/2 inches long and has a 7-foot, 8 1/2-inch span, so it's slightly "over-square." Without radio gear and paint, it weighs 25 pounds, so our projected 27 pounds is starting to look in the ballpark. A finished weight of 432 ounces and a 9-square-foot wing area will give us a loading of 48 ounces per square foot; this is high and will probably give us a stall speed in the region of 30mph.

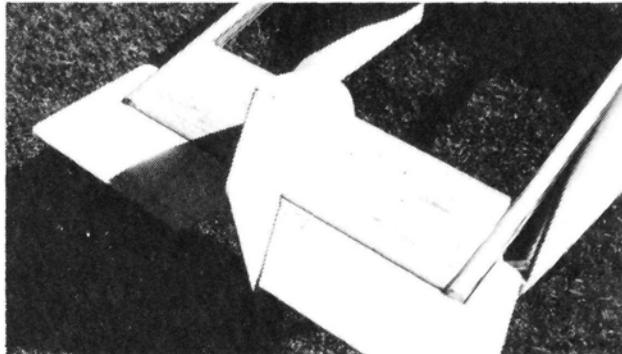
GUIDING THE SAVOIA

When it was time to pick a radio, Mike and I discussed the issue thoroughly. Between us, we've

(Continued on page 34)



Close-up view of carbon fiber and cedar stern V-braces shows staggered-entry-setup fairing boots still to be added.



Top view of tail group. Prototype stab was metal covered; the rest of empennage was fabric covered. Note intersecting rudder and elevator hinge lines.

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FLOATING AROUND



Rear-quarter shot reveals boom/wing entry and handmade metal louvers. Top cutouts will house oil radiator louvers and cockpit.

owned four brands and seen at least half a dozen others put into floatplane service. Of all of them, the Airtronics* was tops for glitch-free performance and reliability. We also considered that Bob Heiticamp, the '89 Schneider winner, used an Airtronics Spectrum 7 radio in his Supermarine S5. Finally, we called Dub Jett, who's a member of the U.S. Championship FAI Pylon Team, and we learned that three out of the four in the Team used the Spectrum 7 to win the world title. We were convinced!

We now have a new Airtronics Spectra PCM 7P to play with. We moved the switches and pots used for set-up to a spot under the front panel, so the exterior is extremely clean and efficient. The row of red lights near the power switch all come on when you throw the switch, and they blink when you switch over to dual rate, aileron/rudder mix, etc. I highly recommend this amazing equipment for high-stakes flying or just "batting around."

I probably shouldn't mention this, but Dub Jett told me that the Pylon Team regularly switches frequencies between the half a dozen crystals that they carry (with only a range check before flying), and they've never been hit! In one instance, after a 10-lap heat, Dub discovered that, under pylon 2, someone had left a turned-on transmitter—on his frequency!

Each time his plane rounded pylon 2, however, Dub's Spectra went into the failsafe mode, so he still won the heat!

CONSTRUCTION WRAP-UP

I've discussed the Savoia floats and the fuselage pod in previous issues. The wing is hot-wired foam with a $\frac{1}{16}$ -inch balsa skin and a $\frac{3}{4}$ -ounce epoxy/glass covering. One triple-laminated plywood spar reinforced with carbon fiber carries the whole load and, to facilitate transportation, the tips are removable outboard of the booms.

To make the booms, we wrapped Styrofoam plugs with three layers of 6-ounce glass-cloth and two strips of carbon fiber in epoxy. When the epoxy had cured, we "melted" the foam out with gasoline, and this left a hollow boom that's tougher than nails and weighs only $5\frac{1}{2}$ ounces.

The entire empennage consists of built-up half ribs over cross-laminated $\frac{1}{16}$ -inch balsa sheeting. The rudder and elevator are hinged with Robart* heavy-duty hinge points and activated with Ace* Swingee internal hinge paddles running on twin cable systems that run out through the trailing edge of the wings and along the booms from servos in the center pod. The tail

(Continued on page 69)

GOLDEN AGE

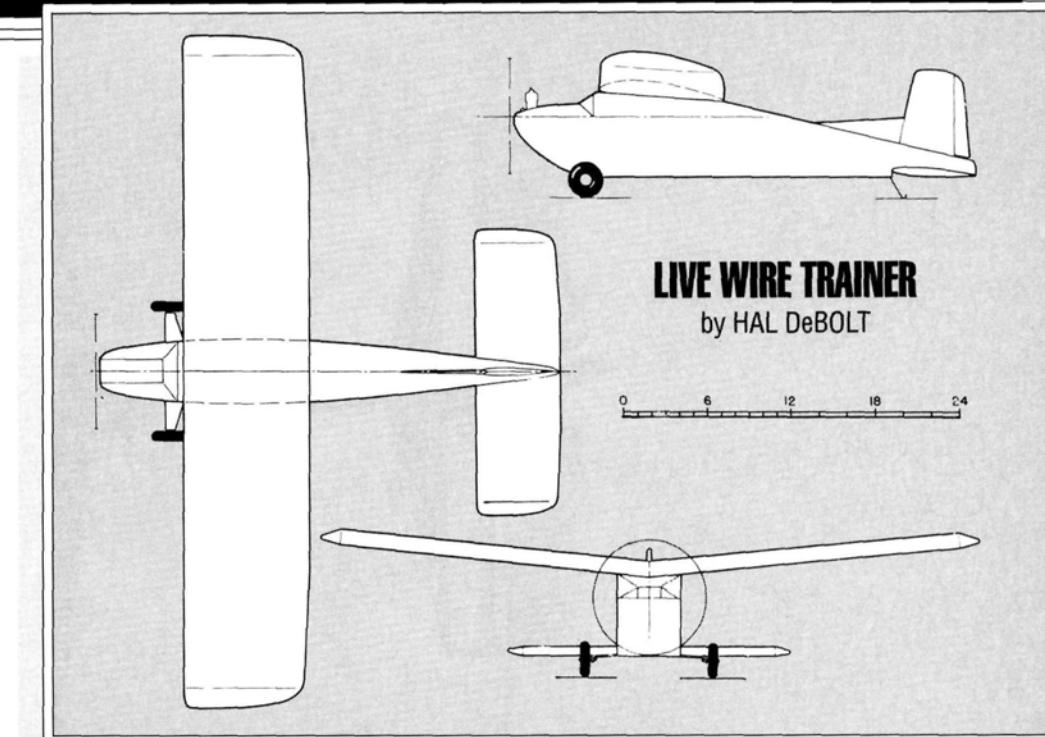
OF RADIO CONTROL

by HAL deBOLT

Spreading the word and collecting the classics!

MOST OF THE TIME, the best I can do is to give you an overview of R/C history, so any details you supply always add much to the story. For example, after reading a recent column about Min-X, Wayne Westra of Allen Park, MI, wrote to say he was an early user and, because he lived close to the factory, he knew some of their people.

Wayne started flying with a Live Wire (LW) Trainer OK Cub .09, and progressed from a Lorenz two-tuber to a Galloping Ghost (tricky and rather primitive!) using a Branco TX and a Min-X receiver. (Many mixed brands then!) Along the way, using an Aerotrol sys-



LIVE WIRE TRAINER

by HAL DeBOLT

The R/C "explosion" of the early '50s didn't just happen; more than 30,000 LW Trainers took to the skies. Wayne Westra won the prestigious Tangerine Internationals with his.

tem, Wayne and his LW managed to win the 3rd Tangerine International meet—big-time R/C in those days! He successfully used Galloping Ghost a lot, and he still has a complete Pulsmite 1200 as well as other Min-X equipment. Wayne thinks Sam Peterson was the last owner of Min-X. Wayne gave R/C up in the Galloping-Ghost days and returned to the wonders of modern equipment only recently.

Wayne was also a neighbor of Bill Bertrand—another Min-X associate. In the early R/C days, Bill set a new FAI R/C distance record by flying 80 miles down the new superhigh-

way between Detroit and Toronto. Given the state of R/C at that time, you can imagine the preparation and development it took to accomplish that!

UNUSUAL APOLOGY!

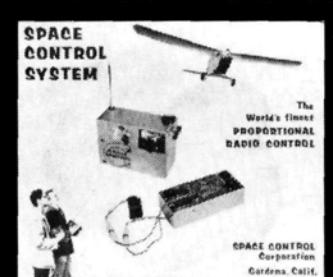
After I mentioned him in the July '90 issue, Zach Allerton wrote with an unusual tale: he was one of the many who attended the early Selinsgrove and Indianetown Gap meetings, and he also participated in Darts meets (Jamestown, NY). Zach managed to put his plane through the windshield of a parked car but, to his astonishment, the owner apologized for parking his car in the wrong place and damaged

Zach's plane! Zach asks, "Can you imagine the lawsuit I'd have today?"

My mentioning Zach brought a phone call from his long-lost friend, Art Slagle of Pittsburgh, PA, who was active in the Pittsburgh Area Competition Effort of those early days. Zach wants to build another Champ, and Art said he would be happy to lend Zach the one he has been flying for 15 years. It's rewarding to help old friends renew their relationship!

SPREADING THE WORD!

Zach included an original copy of the "Printed Circuit." I've said that early



A little nostalgia: the artwork on a Space Control box. A happy Zel Ritchie and a customer use the new Buddy Box training system to fly the LW Cruiser. The system came as a complete unit that was ready to bolt into your model!

GOLDEN AGE

R/C progressed faster because of the ways in which information was spread. *Model Airplane News* and newsletters like Ace's "Grid Leaks" and the North Jersey Club's "Printed Circuit" spread much valuable data. Going by the September '61 issue Zach sent, those newsletters were labors of love: 24, single-spaced, mimeographed pages of solid R/C info!

This issue is full of the news and activities of the day, and it would be a crime not to share some of it with you:

I'll start with the New Jersey Club's annual contest report—the first fine-weather meet for several years (sound familiar?). Three events were flown, and planes were classified according to the *number of channels* used. First was Single-Channel, Rudder-Only; second was Intermediate, Single-Channel with unlimited controls; and third was Multi Channel/Multi Control. (Today, we only fly Multi, and we call it "Pattern.") Modelers specialized in their favorite class (some became extremely proficient) to the extent that a so-called expert in Multi would find it difficult to compete in any other class!

At the '61 meet, the
(Continued on page 116)



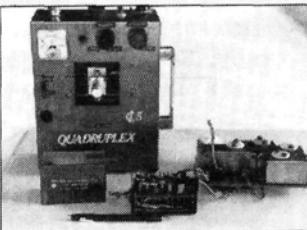
Ron Gwara's museum. He's constantly adding to his collection. Can you see one you might have used? A Beacon Walt Good single channel and a Pro-Line system are easy to spot!

PRESERVING THE PAST

MOST MODELERS KNOW about the Model Engine Collectors' Association (MECA), which began many years ago with one nostalgic guy saving some old engines. The idea caught on, and collecting antique model engines became a hobby within a hobby. There are now many engine collections, their owners enjoying the search for the more obscure types.

Naturally, the increase in demand for the remaining engines has increased their value, and MECA shows have given OT R/Cers excellent opportunities to see them.

If collecting engines is so interesting, why not R/C sys-



From Michael Shabot's extensive collection: a Don Brown Quadrplex C/L5 system.

tems, too? We rarely see an early radio, and when we do, we wonder how it ever worked! Even more than engines, R/C systems progressed so rapidly that obsolescence quickly overtook new, "first-class" developments. As the opportunities for better control increased, systems were continually shelved in favor of new ones. Since early radios are part of the R/C heritage, it would be a tragedy if they were lost. Now's the time for action!

Many OT R/Cers say that when they uncover something they used in the early days, they simply trash the stuff! Fortunately, several have recognized the need for preservation, and I've heard from three modelers who have extensive, R/C system collections to which they're continually adding. What an excellent start!

In California, Michael Sh-

abot has more than 100 interesting systems. He ran brief ads that turned up many "real finds," which he attempts to put into operating order.

Ron Gwara of New York started his collection relatively recently, but he already has 100 systems. He specializes in searching out rare brands that were never numerous—even in their heyday! Like the others, he has a "want" list.

As an early R/Cer in Arizona, Ed Rutherford had systems that became obsolete, but which he never threw out (he simply "shelved" them). Realizing the need to preserve this equipment, he added others and soon had an impressive collection. All his radios (and he surely has hundreds) operate.

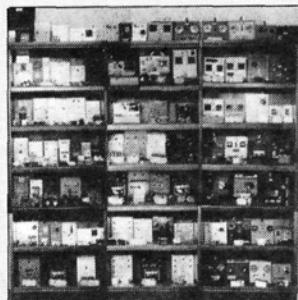
Do you have an old dust-covered radio that you would like to see preserved? Just contact Mike, Ron, or Ed. They all welcome your correspondence and visits (let them know you're coming) and are continually striving to add to their collections. Why not blow off that dust right now?!

You can reach these museum owners at these addresses:

Michael Shabot, 27286 Eastvale Rd., Palos Verdes Peninsula, CA 90274.

Ron Gwara, Box 355, Rt. 1, Waverly, NY 14892.

Ed Rutherford, 1761 W. Magee, Tucson, AZ 85704.



One of the cabinets in which Ed Rutherford displays his fine collection. He has single-channel radios, actuators and the latest in proportional, which he still flies, of course.

SMALL STEPS

The "Super E-Z Bee"—even better!

by JOE WAGNER

R/C MODELS THAT are powered by small engines can make excellent beginner-level trainers, and I've mentioned some in past columns (e.g., Goldberg's Gentle Lady and Sig's Seniorita). For relaxed schoolyard flying, my colleague Randy Randolph's Twilighter can't be "beat" (full-size plans are available from *MAN*), but many beginners are more attracted to ARFs than to build-it-yourself models.

Cox's* widely advertised



PHOTOS BY JOE WAGNER

Daniel Horwitz and his stock Cox E-Z Bee. Daniel may be only 7, but he's a real R/C pilot!

E-Z Bee appeals to many would-be R/C pilots because it's inexpensive, it comes with an engine and a radio, and it looks mighty good! The E-Z Bee flies

well, too—just ask 7-year-old Daniel Horwitz of Woodland Hills, CA.

Last summer, I watched Daniel fly his E-Z Bee at the Sepulveda Basin model airport near Van Nuys. His father hand-launched the plane (its wheels are too small for reliable takeoffs in a wind), and Daniel had no trouble controlling it. Whenever he had any doubts, he let go of the stick, and the E-Z Bee's inherent stability corrected

any problems. Knowing that would happen really helped young Daniel's confidence. He had a terrific time flying his first R/C airplane—and he took it home in one piece!

A few years ago, I got one of the early E-Z Bee kits from Cox Hobbies. The initial production version had several "bugs" (they were corrected in later kits), but when I assembled mine, I decided to do more than just debug it: I converted



Daniel Horwitz's E-Z Bee comes in for a landing. This is the latest production version of Cox's ARF, and all the early "bugs" have been eliminated.

AIRBORNE IN ARKANSAS

I wonder if there's another group of active R/C fliers that's as inventive and adventurous as the gang from Little Rock, AR! Recent issues of *MAN* have featured two of their unusual small-engine-powered projects—Steve Staples' Rogallo Wing and Paul Willenborg's FanTrainer—but there are many more off-the-beaten-track

R/C airplanes in the Arkansas capital!

The picture of Steve Staples' 1/2A autogiro in a recent "Small Steps" drew more reader response than any



Wendell Roberts with his twin-engine A-26 scale model. (This looks like the Korean War version.)

other recent item. Now, AMA Hall-of-Famer H.A. Thomas has sent me photos of, and data on, two more small, interesting R/C models that were designed and built by Wendell Roberts.

One is a sort of tailless biplane—a scale model of an Australian ultralight; the other is a scale twin-engine Douglas A-26. Both airplanes are powered by Cox Queen Bee .074s; to eliminate torque and

prop-wash effects, the twin's right motor spins clockwise.

H.A. tells me that Wendell even invented a construction technique for things such as the A-26's fuselage and



The author's "Super E-Z Bee." A stretched body with all-balsa tail and aft fuselage make it a great soaring performer.

my model into a "Super E-Z Bee"!

BUSY BEE

I ended up modifying every part. I joined the wings at the center with reinforcements and epoxy, and I added curved balsa tips. I put bigger wheels on the landing gear, swapped the engine for a Black Widow, and made a plywood firewall assembly to replace the fragile plastic one.

I cut away most of the foam plastic fuselage aft of the wing, and I built a longer sheet-balsa structure to take its place. The new fuselage is $3\frac{1}{2}$ inches longer than the original, but it's much lighter.

Using light sheet balsa, I made new tail surfaces with curved tips. My fin and rudder are bigger than the Cox foam parts, but my stabilizer is

the same size, except for the increase in span caused by the added curved tips. (I never liked the looks of sawed-off-square flying surfaces!)

My Super E-Z Bee is an excellent flier—smooth and stable, but still very maneuverable. The modifications took a lot of work, but they were definitely worth it!

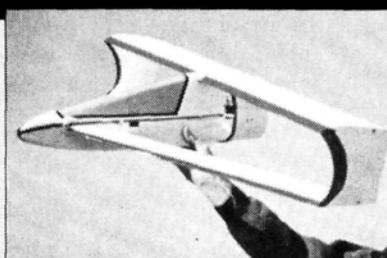
The E-Z Bee's wing is especially efficient, as its high-lift airfoil gives an unusually long glide after the airplane's engine has quit. I often take advantage of this feature to practice thermal hunting: my Super E-Z Bee soars as well as many 2-meter sailplanes!

**Here's the address of the company featured in this article:
Cox Hobbies, 350 W. Rincon St., Corona, CA 91720.*

nacelles. His method of pre-shaping and edge-beveling longitudinal "planks" provides a much stronger structure than the usual "edge butted" planking.

I've seen many other exceptional small R/C aircraft in Little Rock, among them Dave Palmer's all-built-up Grumman F4F Wildcat, Emmett Fry's lovely Focke-Wulf FW-56 Stosser and H.A. Thomas's superb scale Spitfire—all of which have been shown in "Small Steps" in the last year or so.

If you know any other groups who fly small-engine R/C models and can compare with the Little Rockers, let me know!—and be sure to send pictures for this column!



Another Wendell Roberts original! This scale model of an Australian ultralight is powered by a Queen Bee .074 driving a ducted-fan prop.



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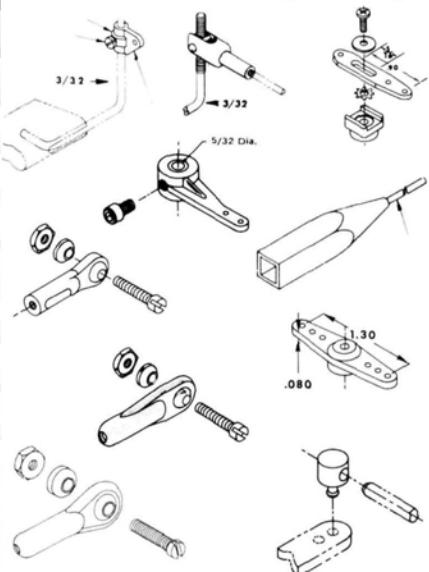
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ENGINE EVALUATION

WEBRA .40

WEBRA

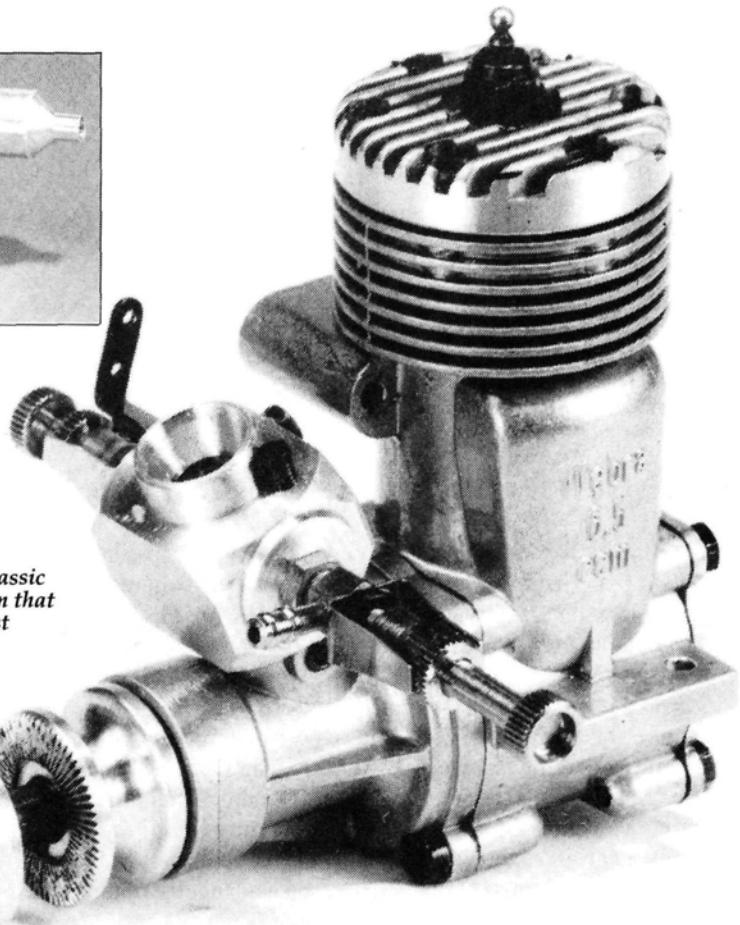
A reliable, cost-effective classic

by MIKE BILLINTON



The crankpin is a highly finished roller pressed into a crankweb. The hardened-steel liner and cast-iron piston ring should last a long time.

Webra .40 is a classic cross-flow design that has stood the test of time.



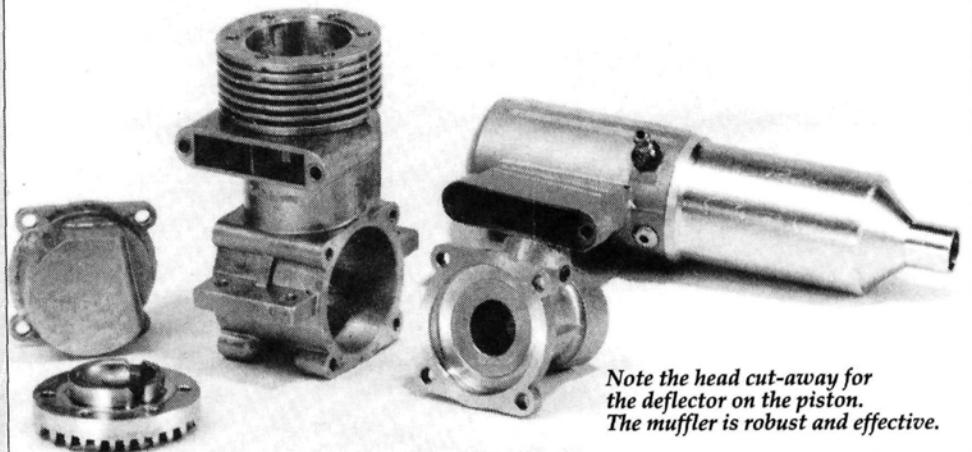
The Schnuerle-ported 2-stroke engine dominates the model-engine market so completely that continuing to produce the earlier cross-flow engine seems redundant. The Austro-German manufacturer Webra has maintained faith in this "simpler" design, but since some Webra engines are available in "speed" versions (with Schnuerle porting), the company is obviously far from rigid.

In some ways, the cross-flow engine is more complicated than the more modern Schnuerle engine. Inexpensive steel liners, high-expansion, heavy-duty aluminum-alloy pistons and a deflector-equipped piston crown (to prevent fuel mixture from escaping too easily from the transfer ports) result in asymmetrical heat-flow patterns that lead to control problems. The supremely resilient ABC Schnuerle engine doesn't have these drawbacks.

Cross-flow porting is easier and less expensive to design and manufacture, but in other respects, the engine makes the same production demands on its manufacturer.

This test of the Webra, R/C, standard, .40ci single-cylinder cross-flow engine gave me a chance to look again at one of the most popular model engines. There's nothing overly sophisticated or flashy here—just good basic engineering at two-thirds the price of the Schnuerle ABC version.

Because of the manufacturing economies mentioned earlier, buyers must pay more attention to running-in a cross-flow engine than an ABC type. In fact, Webra says that, owing to the hardness of the piston ring/liner surfaces, the engine won't be fully run-in until it has been used for many hours. My tests confirmed that this might have contributed to a slight reduction of power at higher rpm (compared with



Note the head cut-away for the deflector on the piston. The muffler is robust and effective.

Webra's claim of .88hp at 15,500rpm). In contrast, the test torque level was greater: .46 Newton meter (Nm) compared with Webra's .40 Nm. (The factory doesn't say whether its findings are in open-exhaust or muffler form.)

MECHANICAL DETAILS

Simple, accurate, pressure die-castings are used for the main parts: crankcase, front housing, rear cover and cylinder head.

The crankcase has the familiar "old-time" large, single transfer passage, while the front cover is detachable and uses the rear main ball bearing for alignment with the case.

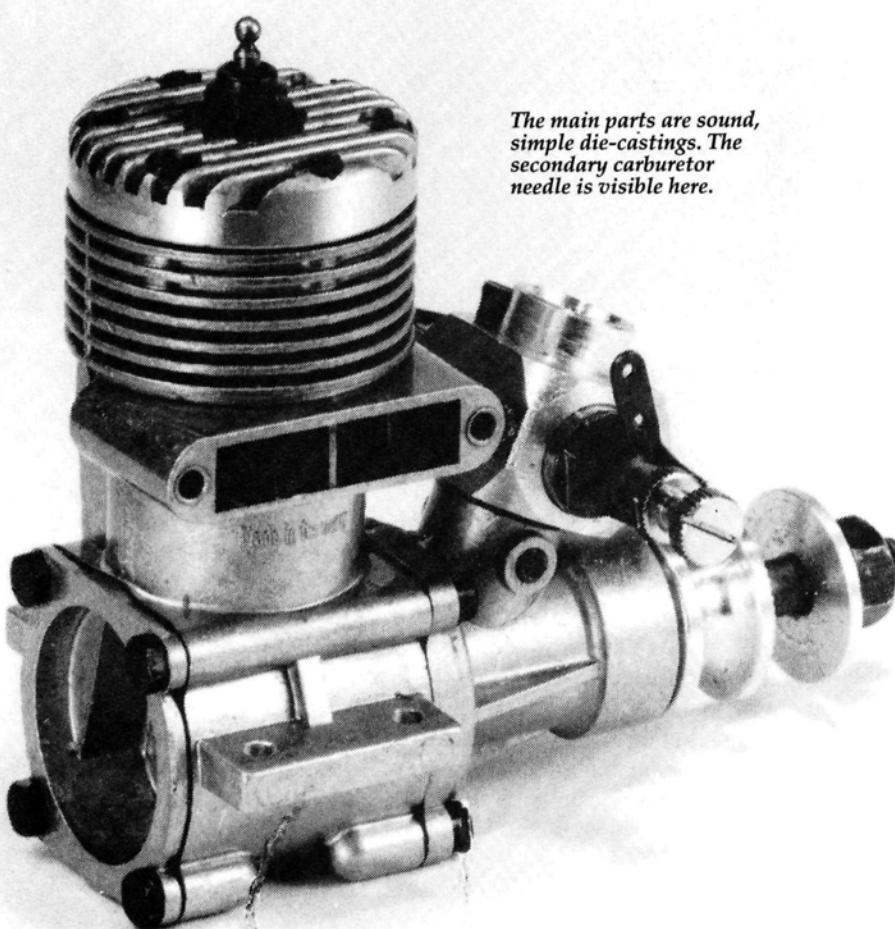
The steel crankshafts use a pressed-in roller (from the roller bearing) as a crankpin. The crankshafts are invariably highly finished, so they're an admirable choice for a model engine where a plain bearing big end (or even a caged or crowded needle-roller big end) is usually found.

The engine has a die-cast, aluminum-alloy, bushed connecting rod, and a fully floating wristpin with brass end caps runs in the high-expansion aluminum-alloy piston. This piston fits inside the hardened and honed steel cylinder liner at a .0025-inch skirt clearance. The crown lands above the single, pegged, cast-iron piston ring at an even greater clearance—.006 inch. The cylinder-head combustion shape is a heli-head configuration with a narrow squish-band. The compression ratio is markedly low at 5.8:1, but it's effective and, no doubt, contributes to the engine's mild performance levels. The cylinder timings and crankshaft induction period are also quite conservative.

The materials used and the designed power levels ensure engine longevity.

PERFORMANCE

The Webra .40 required lengthy, gradual running-in before accurate, steady torque readings could be obtained.

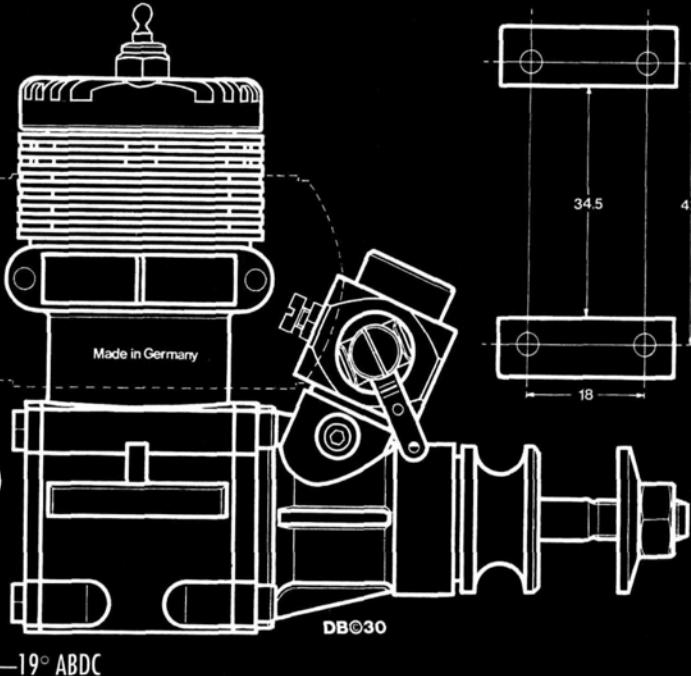


The main parts are sound, simple die-castings. The secondary carburetor needle is visible here.

Capacity400 cubic inch (6.556cc)
Bore828 inch (21.04mm)
Stroke743 inch (18.87mm)
Stroke/bore ratio897:1
Timing periods Exhaust—142°
Transfer—120°

Front Induction: Opens—19° ABDC
Closes—50° ATDC
Total Period—181°
Blowdown—11°

Combustion volume 1.07cc
Compression ratios Geometric—7.13:1
Effective—5.8:1
Exhaust-port height160 inch (4.08mm)
Cylinder-head squish clearance028 inch (.71mm)
Cylinder-head squish angle 0°
Squish-band width084 inch (2.14mm)
Carburetor bore258 inch (6.56mm)
Crankshaft diameter472 inch (12mm)
Crankshaft bore340 inch (8.65mm)
Crankpin diameter197 inch (5.02mm)



55% OF FULL SIZE

Crankshaft nose thread	..... .237x28 TPI (1/4 UNF)
Wristpin diameter	..... .197 inch (5.02mm)
Connecting-rod centers	..... 1.377 inches (35mm)
Engine height	..... 3.25 inches (82.6mm)
Width	..... 2.047 inches (52mm)
Length	..... 3.1 inches (78.7mm)
Width between bearers	..... 1.35 inches (34.3mm)
Mounting-hole dimensions	..... 18x42x3mm
Exhaust-manifold bolt spacing	..... 1.38 inches (35mm)
Frontal area	..... 6.15 square inches
Weight	..... Bare—10.2 ounces (290gm) With muffler—12.55 ounces (357gm)

I checked several standard propeller rpm, and all increased as running-in proceeded. To prevent any decline in rpm caused by overheating and tightening, I had to use over-rich fuel-mixture settings during these early stages. Higher rpm than those I eventually recorded might be possible after the engine has been run longer than the 2½ hours of my test.

Test 1. Open Exhaust: Fuel—5 percent nitro/15 percent castor oil with 5 percent ML70 synthetic oil. Plug—Super Tigre L/R.

Note the relatively flat torque curve that results from the 5,000 to 17,710rpm range. A horsepower maximum of .80 occurred just short of 14,000rpm (remember my earlier comments concerning very lengthy running times), and operation was steady, with a stable heat balance.

Test 2. Standard muffler: Fuel and plug as in Test 1.

At all rpm points, this Webra back-pressure muffler (with its 9.2mm outlet diameter) led to torque reductions—increasingly so, as rpm rose. In this muffler form, suitable rpm (airborne) would appear to be from 8,500 to, say, 12,000. The engine will easily run down to a full-throttle 6,500rpm, but it generates approximately half the maximum power output in

doing so. A 9x7 propeller is recommended, but a wide range is possible—from approximately 12x7 up to 10x5.

IDLING

The standard, aluminum-body, Webra twin-needle carburetor gave a good idling performance (around 2,900rpm) with good pick-up when the sensitive mid-range/idle needle had been positioned correctly. In fact, the glow-plug was more important in achieving this good pick-up—probably because of the cross-flow-scavange design and the low compression ratio used.

There wasn't a Webra plug available at the time of the test, but there are many alternatives. I found that one of the heavy-element/high-current plugs (i.e., the Rossi 8 or OPS 300) gave a better result than a Fox idle-bar plug or a Super Tigre long-reach plug, which I had used for most of the test.

SOUND LEVELS

The recorded dB levels increased when the muffler was removed and were definitely reduced when a muffler was used. As I've found in other engine tests, we have a way to go be-

Performance:

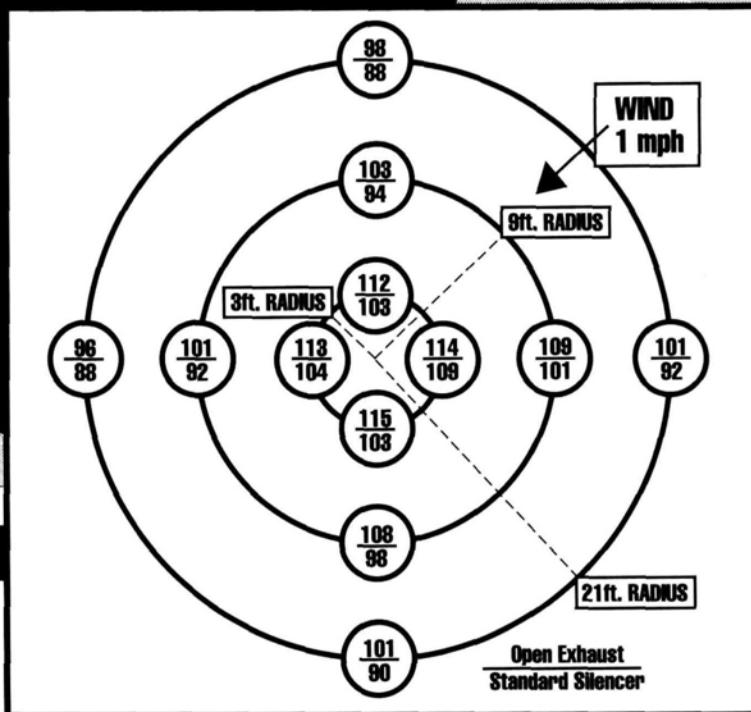
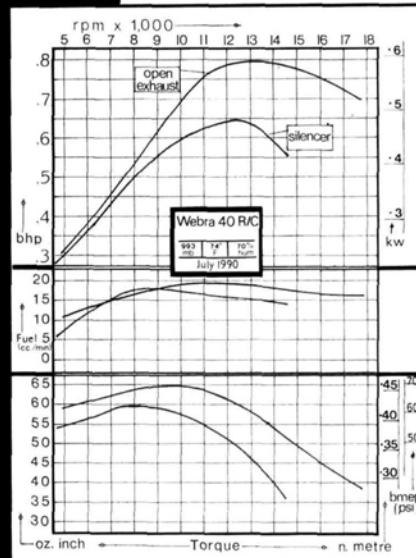
Max. BHP	80 @ 13,783rpm	(Open exhaust/5% nitro)
	65 @ 12,387rp	(Standard muffler/5% nitro)
Max. Torque	65 oz. in. @ 9,825rpm	(Open exhaust/5% nitro)
	65 oz. in. @ 7,650rpm	(Standard muffler/5% nitro)

RPM on standard propellers:**Open exhaust**

	Open exhaust	Standard muffler
13x6 MK	7,920	7,990
12x6 Graupner	9,530	9,360
11x7½ Airflow	10,120	10,010
11x5 Top Flite	11,130	10,920
10x4 Taipan	13,790	13,510
9x4 Zinger	15,540	15,150

Performance Equivalents:

BHP/cubic inch	2.0
BHP/cc	.122
Ounce inch/cubic inch	162.5
Ounce inch/cc	9.91
Ounce inch/pound	101.9
Gram meter/cc	7.01
BHP/pound	1.25
BHP/kilo	2.76
BHP/square inch frontal area	.13

Manufacturer: Webra Modelmotoren, Austria.**Distributor:** Hobby Dynamics,
301 Holbrook Dr., Wheeling, IL 60090.**SOUND LEVELS—dB****Engine:** Webra .40 R/C**Equipment:** open exhaust and standard muffler**Fuel:** 5 percent nitro/20 percent oil**Engine position:** 3 feet above the ground**Temperature:** 74 °F**Humidity:** 70 percent**Propeller:** 11x5 Top Flite**Mean rpm:** 10,400 (achieved by throttle adjustment)**Sound meter:** Radio Shack's 33-2050 unit set 38 inches above the ground and pointing toward the nearest sound, i.e., propeller, muffler, or open exhaust. Three distances were used: 3 feet, 9 feet and approximately 22 feet.**Meter settings:** "A" Scale and "Slow" response.

fore an engine's out-of-the-box sound level will be low enough to meet certain agreed standards.

SUMMARY

The Webra .40 (named "Silverline" in the U.S.) is really a classic from an earlier era, but, given the metallurgy employed, I'm sure it will be running well into the next. I had no mechanical problems or failures, but, for the most reliable operation, this engine must be carefully run-in. ■

BASICS OF

OF RADIO CONTROL

by RANDY RANDOLPH

Instructions: You're never too wise to need them!

FOR several years, The Academy of Model Aeronautics (AMA) has had a Delta Dart building program. The Delta Dart is a simple rubber-powered model that uses a single balsa stick for its fuselage. A number of companies manufacture the kits, and the AMA distributes them to model clubs, schools, churches, scout troops, or any organization that wants to introduce its members to modeling. The affordable kits are packed in bulk (40 kits in a box).

The Delta Dart's wings and tail are built on, and attached to, the rear of the plan. To remove them from the plan, you cut around them with a razor blade after the glue has set. The result is a completely covered wing and a tail that's ready to be glued to the fuselage. A properly constructed and powered Dart is capable of flying for 1 minute or more in a high school gym and much longer outdoors.

Thousands of Delta Darts have been built by inexperienced young people at trade and mall shows all over the country. The instructions that come with each airplane are very good

and have clear pictures that demonstrate every assembly step. The plan is printed so that you can read the additional instructions when it's face-down on the work board, but not when it's face-up. In short, the plans and instructions are as fail-safe as possible!

READ CAREFULLY!

Manufacturers spend millions of dollars to pro-

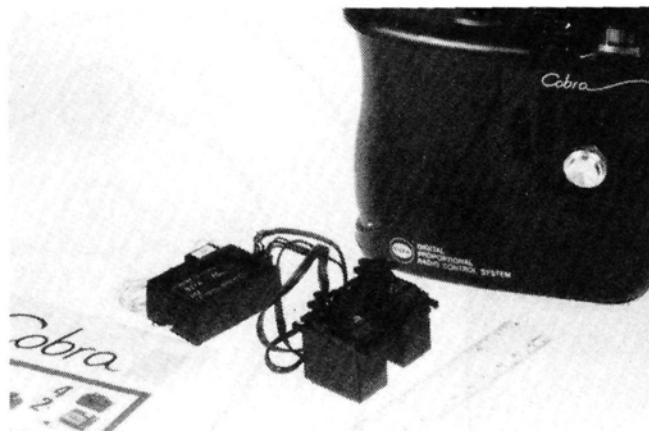
Checking a kit's contents acquaints you with the parts and their locations so that you won't waste time searching for and identifying needed pieces. If a kit is incomplete, you can return it, or notify the manufacturer and, while you're waiting for the missing part, you can begin constructing other sections of the kit. If you discover that a part is missing when you need it in

followed or subsequent parts simply can't be added! With certain techniques, the instructions may offer a different approach to performing a standard operation.

MORE THAN MEETS THE EYE!

The instructions that come with the products we use contain some of the most valuable information. Manufacturers of adhesives, covering materials, radios, paints, tools, batteries and other accessories not only provide simple instructions on how to use their products, but they also show new applications and techniques that add to our storehouse of knowledge. It makes absolutely no sense to ignore this important information! A notebook containing the instruction sheets from everything we buy or build can become an invaluable reference source.

Manufacturers want us to be happy with their products. They work hard to produce a good product and tell us how to use it properly. So, when you're building a kit, even if you're modifying the design for your own purposes, make sure that you understand the instructions! You'll get far better results! ■


The new Cox Cobra 2-channel system has single-stick operation as well as an output meter, servo-reversing on both channels and a new, convenient, transmitter shape. Its instruction booklet (bottom left) has easy-to-read instructions, helpful illustrations and can be read in 10 minutes.

duce instructions that people will read and understand! Before a kit is put on the market, most manufacturers have asked experienced people to assemble prototype kits. When they find the easiest assembly sequence, it's described in the kit's assembly manual.

Most kit instructions ask you to check the parts list for missing pieces before doing anything else. For several reasons, this step is imperative with any new project.

a sub-assembly, however, waiting for it is maddening, and it's too late to return the kit.

When you're given step-by-step procedures, follow them to the letter! If necessary, read them several times until you fully understand them. Without fail, if you overlook or bypass any small step, you create additional work and trouble that exceeds the original effort. In many cases, certain assembly sequences must be

CONSTRUCTION

WHAT MAKES the Ultimate unique?—its sharp, angular shape is one reason; how it evolved is another. Designed by modelers Bob Godfrey and

Don Lowe (our AMA president), this plane was an R/C model *before* it was developed into a full-size plane.

Build the exceptional aerobatic biplane that spawned a full-scale ship

It's more usual to build a full-size plane first, using a model for wind-tunnel testing, etc., but because the Ultimate flew so well, the reverse is true. I like the

"model-makes-good" version of the process—just think, someday there might be a man-carrying Ugly-Stik!

The Ultimate might replace the Laser as the precision aerobatic aircraft of the '90s. Fourteen top competitors have bought the 30-percent-scale Ultimate for the Tournament of Champions: that's pretty exciting. Like many R/Cers, however, I'm a Sunday flier. I was looking for something that was different, easy to fly, and



T H E

ULTIMATE BIPLANE

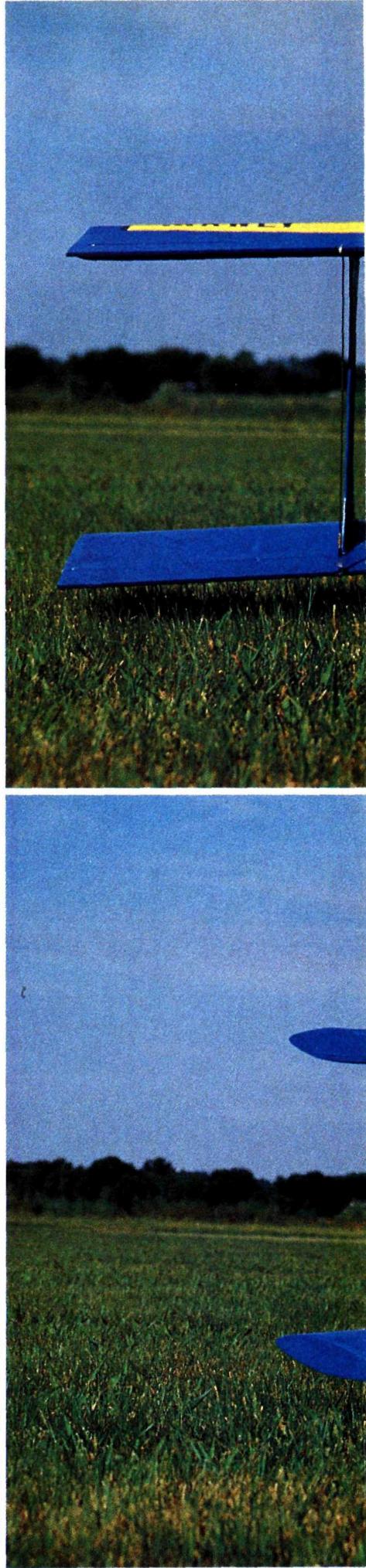
by
**FLOYD
MANLY**

capable of doing all that I asked of it. It's not often that I'll attempt knife-edge loops, or low inverted passes across the field (my nerves and my pocketbook can't take the strain), but it's

exciting to know that my plane is capable of maneuvers that I can't handle!

My Ultimate started to take shape after I had seen a picture of a giant-size version in *MAN*. While I was studying photos and trying to finalize the shape, I considered the construction methods I could use and the available parts that would fit. At just about the time I started to cut and glue the wood together, Goldberg announced its plans to make a kit! Rather than wait for its version, I decided to continue my scratch-building, and I'm glad that I did.

I wanted to complete my plans before 19 other manufacturers put out their versions, so decisions had to be made quickly. Because brass is easy to bend,







The three-blade Graupner 12x8 prop requires a Perry fuel pump for smooth mid-range transition.

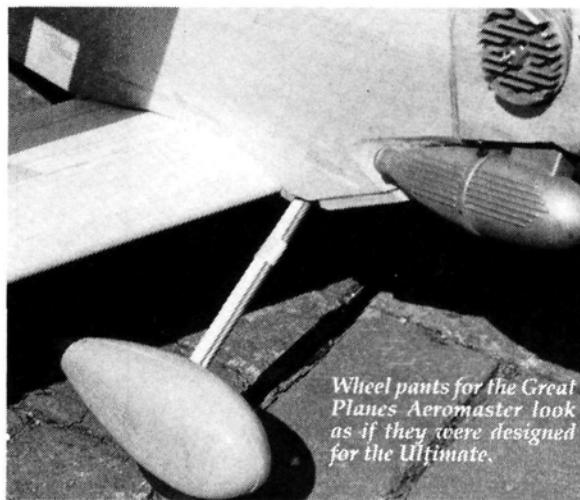
drill, and solder (certainly easier than trying to form music wire), I decided on K&S*. .032x.5-inch brass for the cabanes. I chose Aeromaster II wheel pants from Great Planes Model Distributors*, and I ordered a Tru-Turn* 2³/₄-inch spinner to fit the Graupner* 12x8-inch three-blade prop. The Fox*. 74 easily swings a standard 11x7 prop, which is more in its range, but I liked the look of the three-blade one.

I opted for two servos for the ailerons. I mounted both in the bottom wing and connected them to the top ailerons with trailing-edge pushrods. (The Ultimate has a very positive, definite roll rate.) I

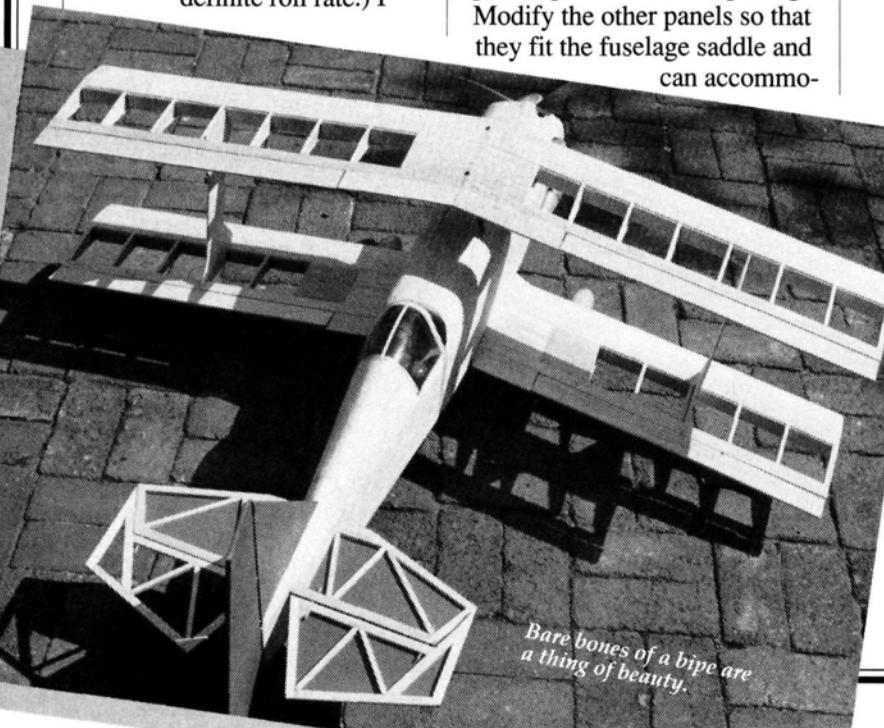
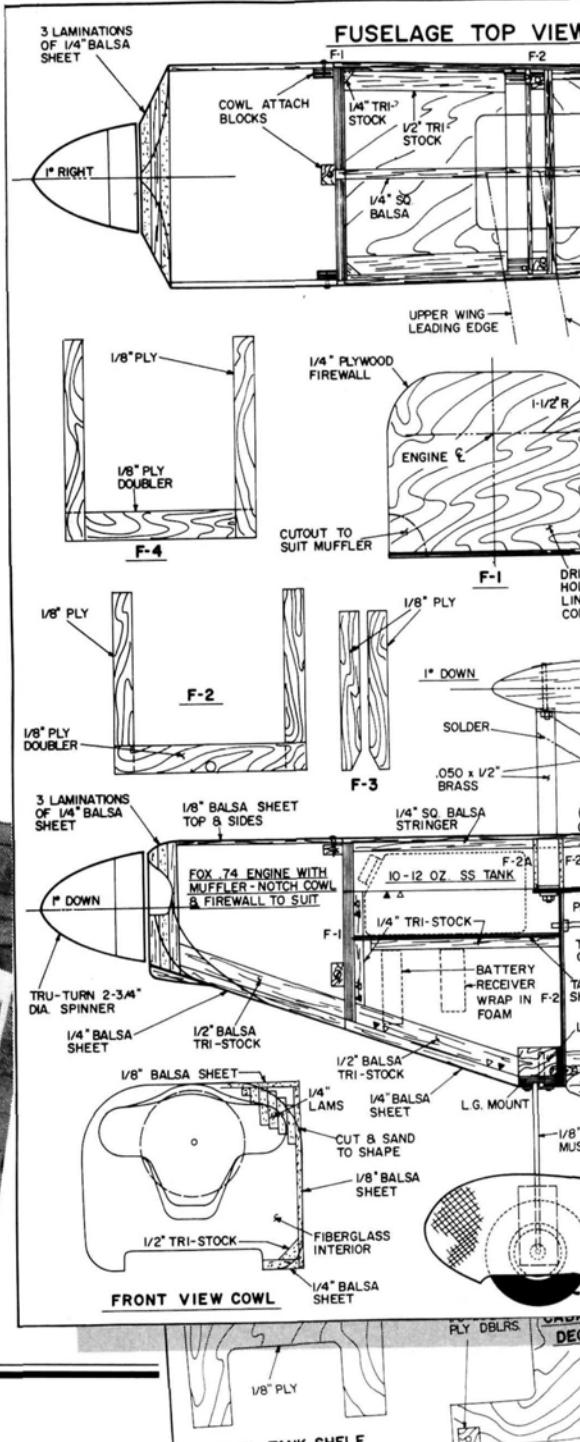
chose a Futaba* FP-7UAF radio. The FP-7UAF was in my price range and is a quantum leap up from the old FG series radios. It has so many new features—15 different adjustable or selective functions—that I felt I might need to go to school to learn all it could do for me! It's also comfortable to hold, offering a good touch that seems to extend to the aircraft.

WINGS

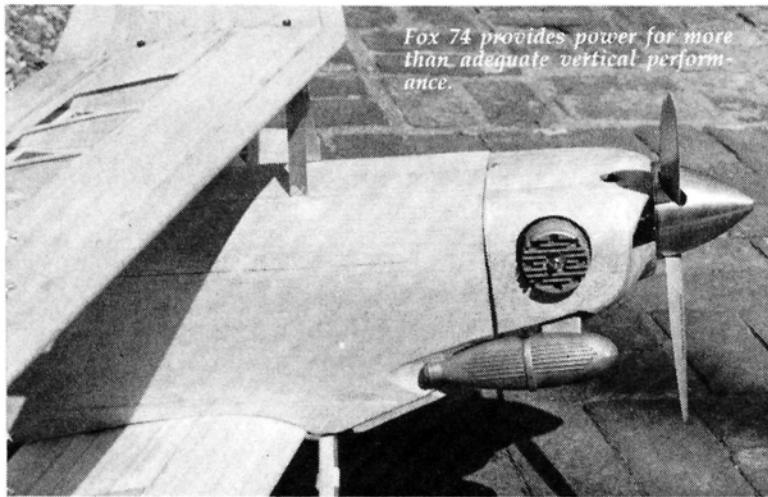
The wings are standard D-tubes with add-on ailerons. Cut 36 ribs out of firm, 1/16-inch balsa stock. Mark their tops, and cut four ribs of 1/4-inch balsa. Build the two left panels first; then the two right ones; and join a pair of panels for the top wing. Modify the other panels so that they fit the fuselage saddle and can accommo-



Wheel pants for the Great Planes Aeromaster look as if they were designed for the Ultimate.



Bare bones of a biplane are a thing of beauty.



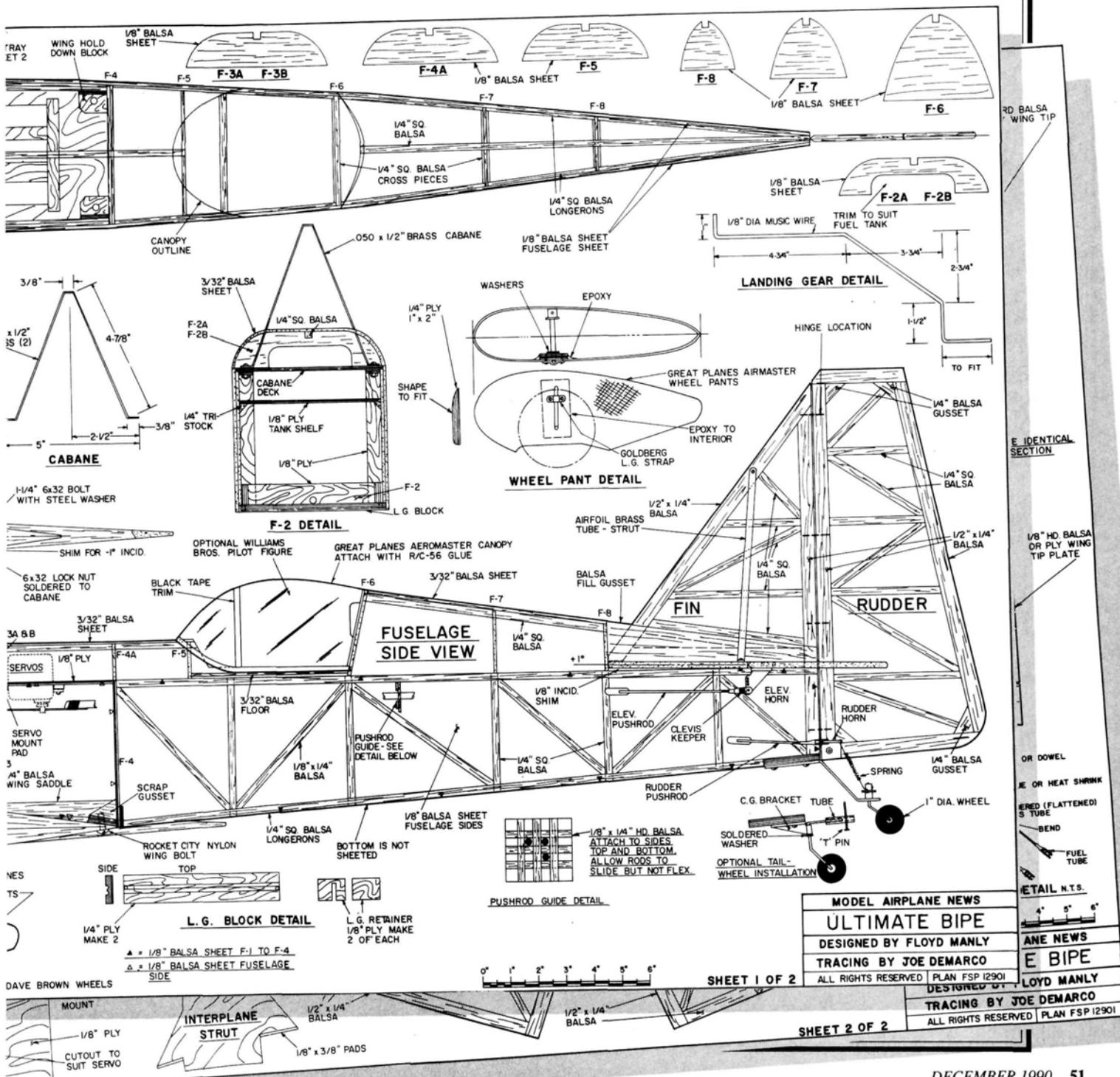
Fox 74 provides power for more than adequate vertical performance.

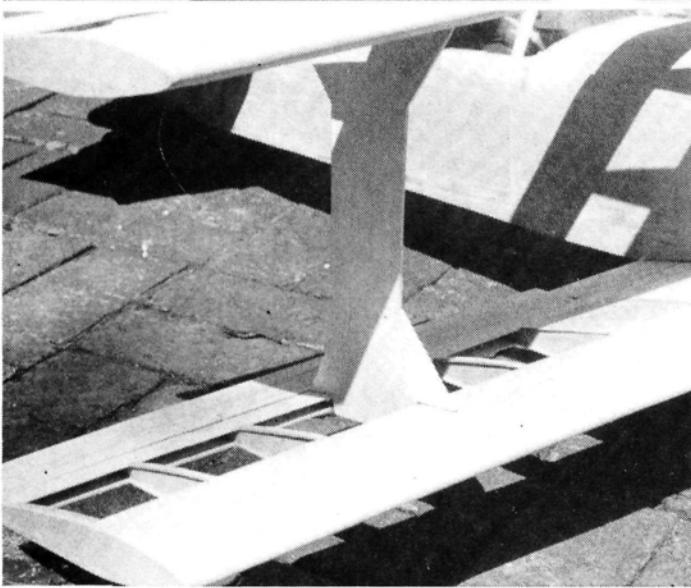
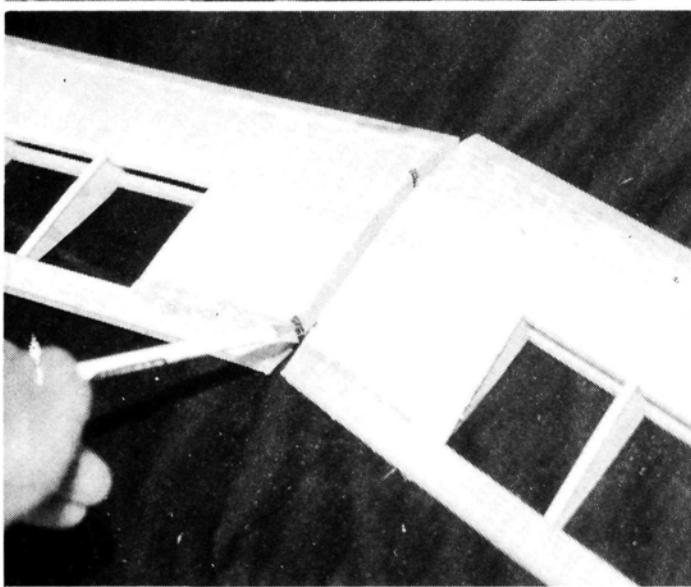
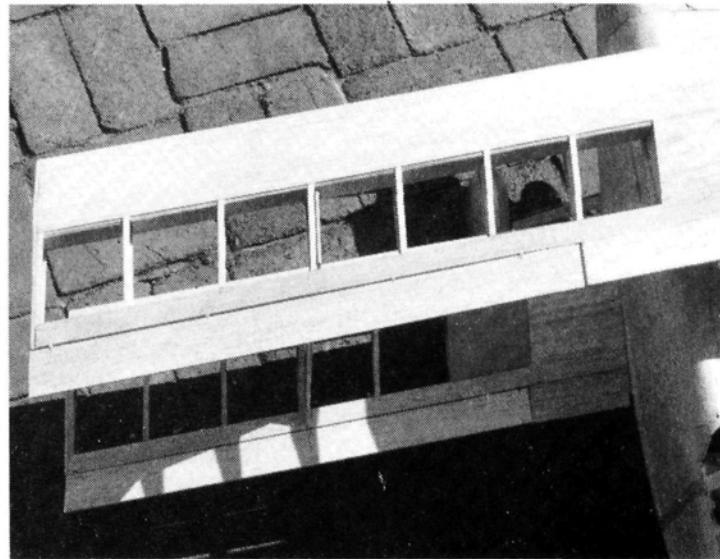
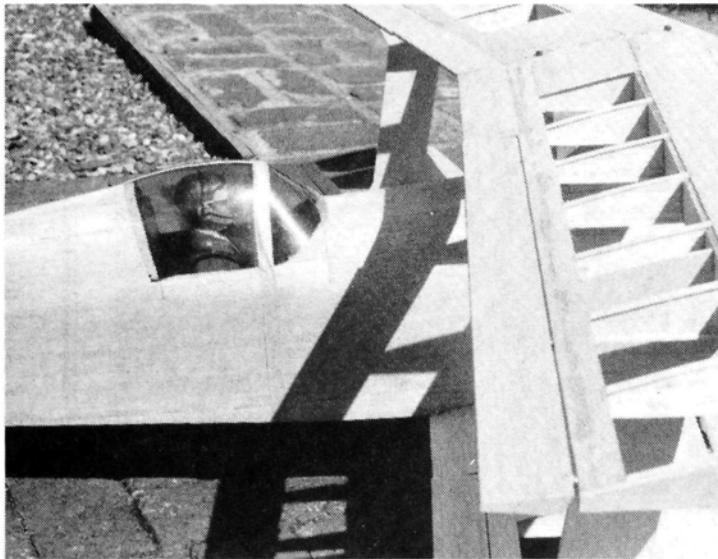


An incredible aerobatic performer that gave rise to a full-scale plane of the same name, the Ultimate is easy to fly yet capable

#FSP12901 ULTIMATE BIPE \$19.00

of doing all that you ask of it. It's favored by many top aerobatics competitors. The plan is suitable for "high-level" intermediate builders. Two full-size sheets. WS: 81"; L: 49.5"; engine: .45 to .74ci; 4 channels. LD: 2.





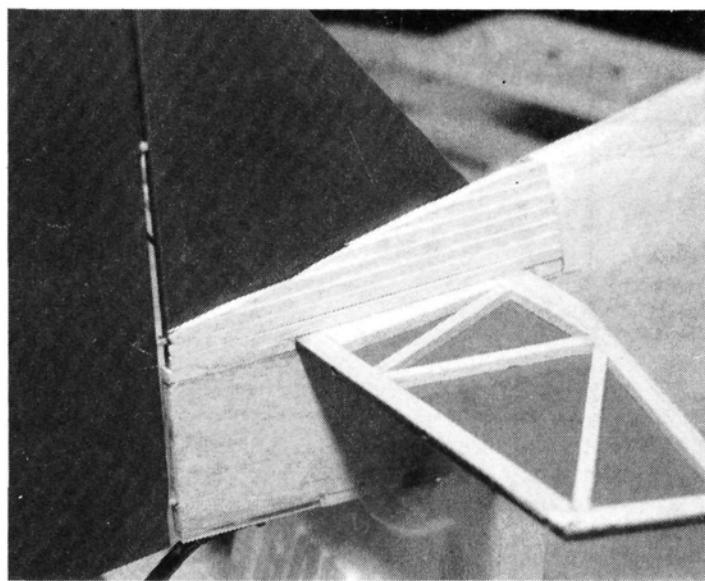
■ Clockwise from above: Interplane struts are compression-loaded with no screws or bolts required. ■ Both sets of swept-back wings must be glass-clothed. ■ Bubble canopy can be selected from several that are available at your dealer. ■ Full-span ailerons, top and bottom, motivate superior roll activities. ■ Built-up horizontal stab and gusset fitted before covering. Enormous vertical fin and rudder provide authority for yaw functions and knife edge.

date the servo bays. Select your wood carefully. Use the stiffer $\frac{1}{16}$ -inch balsa for the ribs. Match the $\frac{3}{32}$ sheets for weight and hardness on the left and right, as well as on the top and bottom. If you don't, you could end up with all the soft, mushy stuff on one wing panel. A judicious use of glue will keep the weight down. Bob Smith Inc.*¹, a new outfit in California, makes an excellent, odorless, instant CA in both thick and thin versions. (Odorless CA doesn't irritate the eyes when it kicks off.)

Select a pair of panels for the top wing and, before joining the halves, cut the vertical grooves in both center ribs so that the $\frac{3}{16}$ -inch-o.d. brass tubes for the attachment bolts can be installed. Locate their positions from the side view of the cabanes. Cut the ailerons and the wing center trailing edges out of $1\frac{1}{2} \times \frac{3}{8}$ -inch tapered stock, which is available from Balsa USA*.

The bottom wing will have the aileron servos mounted in each outboard number-four bay. It's easier to work on these if the top sheeting and the top capstrips aren't installed in this area until later. A single, 28-foot-per-ounce servo in a center bay driving all four ailerons might be adequate, but I opted for the security and muscle of an extra servo. My Ultimate does axial rolls as if it's on a wire!

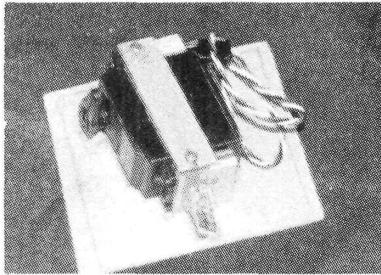
I modified the bottom wing to fit in the wing saddle by



cutting the leading edge and then re-gluing it so that it was square with the fuselage former F-2. I then cut away the trailing-edge tapered stock so that it was square with former F-4. It sounds more complicated than it is. Check the plans.

Attaching the wings is a process that requires a lot of patience. Here's my method:

- Install the motor to 2 degrees down and 1 degree right thrust, relative to the fuselage top and center datum lines.
- Before drilling the hole for the bolt, you'll need a Robart Incidence Meter and a 36-inch ruler to align the bottom wing. For a good fit and proper alignment at zero degrees, you may have to carve and sand the wing saddle.



Aileron servo mounted to $\frac{1}{8}$ -inch-ply platform prior to installation at wing bay.

- Install the $\frac{1}{4}$ -inch wing dowel.
- Measure from each wing tip to the fuselage tail post. When these are equal, draw reference lines, or arrows, to check that the wing doesn't move while you're drilling and tapping the bolt holes.
- Now stop, and make sure that the motor, the fuselage and the bottom wing are aligned. If not, go back and get it right before proceeding.
- The top wing and the horizontal stab can be installed in the same way, always referring to the motor mount as the "hard point."
- Always use the datum line as a reference for each measurement. Don't use the work you've just completed as a reference point for the next step. If you do, and each measurement is slightly off, the final installation can be misaligned enough to cause serious flying problems.

(Continued on page 69)



APC

PROPELLERS



- Sound Supression Design
- High Thrust Efficiency
- Constant True Pitch
- Long Fiber Advanced Composite Material
- Proven Performance at US Masters, US Nationals, Canadian Nationals, and 1989 World Championships

Sport Sizes

5.7 x 3	\$1.59 EACH
7 x 3	\$1.59 EACH
7 x 4	\$1.59 EACH
7 x 5	\$1.59 EACH
7 x 6	\$1.59 EACH
7 x 7	\$1.59 EACH
7 x 8	\$1.59 EACH
7 x 9	\$1.59 EACH
7 x 10	\$1.59 EACH
8 x 4	\$1.79 EACH
8 x 5	\$1.79 EACH
8 x 6	\$1.79 EACH
8 x 7	\$1.79 EACH
8 x 8	\$1.79 EACH
8 x 9	\$1.79 EACH
8 x 10	\$1.79 EACH
9 x 4	\$1.99 EACH
9 x 5	\$1.99 EACH

9 x 6	\$1.99 EACH
9 x 7	\$1.99 EACH
9 x 8	\$1.99 EACH
9 x 9	\$1.99 EACH
9 x 10	\$1.99 EACH
9.5 x 4.5	\$2.29 EACH
10 x 6	\$2.29 EACH
10 x 7	\$2.29 EACH
10 x 8	\$2.29 EACH
10 x 9	\$2.29 EACH
10 x 10	\$2.29 EACH
11 x 6	\$2.49 EACH
11 x 7	\$2.49 EACH
11 x 8	\$2.49 EACH
11 x 9	\$2.49 EACH
12 x 6	\$2.89 EACH
12 x 7	\$2.89 EACH
12 x 8	\$2.89 EACH

Competition Sizes

11 x 10	\$7.95 EACH
11 x 11	\$7.95 EACH
11 x 12	\$7.95 EACH
11 x 13	\$7.95 EACH
11 x 14	\$7.95 EACH
12 x 9	\$7.95 EACH
12 x 10	\$7.95 EACH
12 x 11	\$7.95 EACH
12 x 12	\$7.95 EACH
12 x 13	\$7.95 EACH
12 x 14	\$7.95 EACH
11 x 12W	\$7.95 EACH
12 x 10W	\$7.95 EACH
13.5 x 12.5	\$12.95 EACH
14 x 8	\$12.95 EACH
14 x 14	\$12.95 EACH

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Another Great Twin Amphibian from G & P Sales — GRUMMAN ALBATROSS HU-16B



81" wingspan; 810 sq. in.; 13 lbs.; twin .40 2C engine size; fiberglass fuselage; foam wing and stab cores; includes all wood; vac. formed cowls and nacelles.

\$239.95 plus shipping & tax where applicable
Retractable landing gear kit \$179.95
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CONSOLIDATED PBY-5A CATALINA

81" span; 969 sq. in.; 11 lbs.; twin 30-40 engine size; fiberglass fuselage; foam wing and stab cores; vac. formed clear acetate cockpit and blisters; includes all wood; vac. formed styrene cowls and nacelles; preformed landing gear for land operation; retractable wing floats.

\$239.95 plus shipping & tax where applicable
90 min. VHS video on building & flying \$24.95

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GIANT STEPS

Hibernating for the winter? Don't just throw your valuable equipment into the attic!

by DICK PHILLIPS

IT HARDLY seems possible that another flying season is ending. For most of us, the fall and winter

bring the season to a close, and it's time to do a few chores!

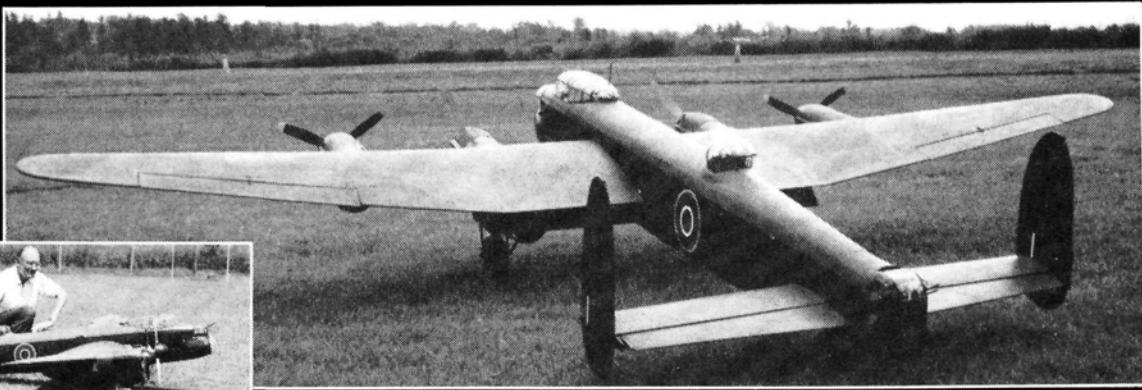
INSPECT AND REPAIR

It's a temptation to store your models, put your ra-

dios on the shelf and get out the building board. We usually have a project or two planned for the "non-flying" months and are naturally eager to get started, but if you don't put things away

properly, you might face expensive problems next spring. Before you hang up this year's models, check them carefully so that they'll be in good order

(Continued on page 56)



NEW LANCASTER PLAN

LEN BOSMAN, a fellow Canadian who has produced some excellent model plans, has just completed the prototype for an ambitious project: the British Lancaster bomber of WW II fame!

Many comparisons have been made between the Lancaster and the B-17 Flying Fortress. In some of the comparisons, the B-17 is considered inferior. Although the Lancaster could carry a larger bomb load and carry it further, comparing them isn't fair. The B-17 had more offensive armament (a minimum of 10 .50-caliber machine guns; the Lancaster had fewer .30-caliber guns).

The B-17 had self-sealing tanks, protective armor for the crew and a number of "crew comforts" that the Lancaster didn't have. The Fortress flew its raids in daylight and had serious fighter opposition. The Lancaster bombed at night and had to contend with the Luftwaffe.

We'd all like to be able to say our bird flew "right off the board," and some of us do—whether it's true or not! Len was delighted with the Lancaster's initial flight—it greatly exceeded his expectations.

* The model replicates the Mynarski Lancaster, the only flying Lancaster in Canada. It's owned by the Warplane Heritage Museum in Hamilton, Ontario, and it has been flown around Canada and in shows like the Abbotsford Airshow near Vancouver, B.C. (I was lucky enough to recognize the sound of its Rolls engines in time to watch it

make a double fly-by at the airport, just 1/2 mile from my front door—an experience I won't soon forget! If I had known that it was coming, I'd have had my nose up against the airport fence and a camera in my hands!)

Len's Lancaster spans 136 inches at 1/9 scale. Its fuselage is 93 inches long; it weighs 34 pounds; and it's powered by two Quadra 40s. The outboard nacelles are



dummies and the props spin in the airflow. The model uses non-retractable landing gear, but Len is working on retracts for it. He says, "The Lancaster in flight doesn't look right with those large wheels dangling under its wings."

Len will make this plan available as soon as it's finished, and he has fully tested its flight characteristics. For the details and the price, send a SASE to Len Bosman.* Since he lives in Canada, get an International Postal Reply Coupon from your post office or just include loose stamps in the SASE. He can use them for his own SASEs.

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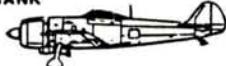
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GIANT STEPS

when spring arrives!

Inspect and repair the airframes (who remembers the IRAN program?). Make sure that all the control runs are working correctly and that the cable runs are free and clean. Check all the control-run connections and fasteners. If there are parts about which you have doubts, or if you made any temporary repairs at the field, now is the time for complete repairs—even if you have to remove the cover to inspect the trouble spot. It's better to solve the problem now than to take your plane home in a bag next spring! As a rule, I don't fly a model unless I'm confident that its performance will be good. If it isn't as good as you can make it, don't fly it!

Although this inspection is important for all models, it's particularly important for large ones. The "big" aircraft are always under scrutiny, so avoiding accidents is more important for them than for the conventional-size models.

BATTERIES

Regularly remove and recycle the flight batteries during the winter. There's nothing worse for a battery than lying idle for months! I use a cycler and, to keep track of the process, I maintain a detailed battery logbook. When I recycle a battery, I log its number, the date, the cycle time and the charge and the discharge, and then I go on to the next one.

Although there are several articles on batteries, their recommendations vary. I cycle mine once a month while they're inactive, and I keep a log to assure me that they're performing properly. If a battery's performance deteriorates, it becomes obvious during the charge/discharge process, and I take steps to determine and correct the problem.

When there's a problem, it's often confined to a single cell. Don't be afraid to take a battery pack apart and check the individual cells. Sometimes, you can replace one cell and bring the entire pack back to nominal operating levels, but a good motto is, "If in doubt, chuck it out!"

When you buy new packs or replace cells in old packs, buy the best you can find. If the quality of a cell or pack is marginal, you could lose the entire model. Use name-brand batteries and deal with a reputable firm to ensure that you'll get what you want. I use SR* Batteries, and they've always exceeded their specifications.

ENGINES

Engine manufacturers indicate what kind of care their products should receive. If you haven't read the material that came with the engine, do so, and follow the long-term storage instructions. When I buy a new engine, I file the instructions in a loose-leaf book so I can always find them.

Run any leftover fuel out of the fuel system before you store the engine. This protects the engine and reduces the risk of fire in the workshop. Simply set up the model so that the fuel pickup can reach all the fuel in the tank, and then run the engine until it quits. This removes fuel from the tank, the fuel lines and the carburetor.

If you use a "storage" fuel (one that's designed to protect engines during periods of inactivity) follow the directions on the package.

FUEL

If you store gasoline or glow fuel during the winter, they can deteriorate, and this leads to future problems. At the end of the season, throw out any unused fuel. Although this seems wasteful, it can be economical in the long term. Stale fuel causes starting problems and creates excessive deposits in the engine.

RADIOS

If your model's radio is protected from dust, it won't need further attention. If not, cover it with a large plastic bag to prevent dust from getting inside. Close the bag's open end with an elastic band or a twist-tie. You can protect your transmitters in the same way. There are many inexpensive and convenient sealable plastic bags on the market, and they can protect your Tx from dust and extreme changes in humidity. (Continued on page 97)

ABOUT THOSE ENGINES

by JOE WAGNER

The Glow Plug "Glow"

If IT HADN'T been for the development of glow plugs, model engines would never have attained their present level of popularity in the U.S., yet few modelers understand exactly how glow plugs work. The usual explanation is, "The plug contains a wire heating element that glows 'orange-hot' when it's connected to a battery. This glowing filament ignites the fuel/air mixture in the cylinder and, after the engine has started, the heat of combustion keeps the plug element hot after the battery has been disconnected." That sounds logical enough, but if it were that simple, you could make glow plugs with nichrome-alloy heating coils (like those found in electric toasters) instead of expensive platinum, and

plugs would sell for about 50 cents!

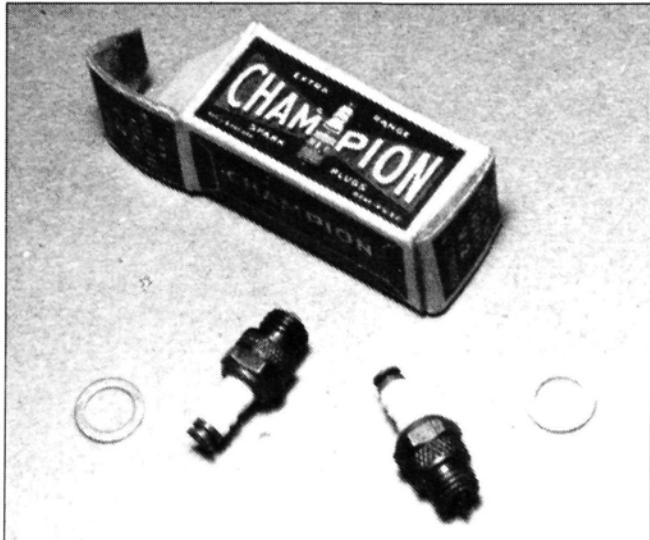
What *really* makes a glow plug ignite a fuel/air mixture is the *catalytic action* of the platinum alloy in the element. Platinum's ability to ignite alcohol fuels was discovered by the British chemist Sir Humphrey Davy in 1816, and "automatic lighters" that used platinum as an ignitor were available in the 1830s (long before practical matches had been invented!).

ATOM ADJUSTMENTS

Although it's a gross oversimplification, think of platinum atoms as golf balls; they're covered with "dimples," which strongly attract hydrogen and oxygen atoms. When they nestle snugly into the platinum atoms' "dimples," the oxygen and hydrogen atoms wedge tightly against one another—so tightly that they combine chemically to produce heat and initiate combustion. As hydrogen and oxygen catalytically combine on the platinum atoms' surface, the energy of their combustion forces them out of the "dimples," making room for new, separated oxygen and hydrogen atoms that will undergo the same process.



The business end of a Champion glow plug. Note the idle bar, even though glow engines with throttle weren't available until years later.



These circa-1950 Champion V-3 size glow plugs are particularly rare.

You don't have to heat the platinum to produce this reaction! It might get hot because of the combustion, but the catalytic action works very well when the platinum is at room temperature. Because of this property of the platinum (and its alloys) that are used in glow-plug filaments, it's actually possible to start a glow engine without a battery. (I've done it myself more than once, but it's not easy.)

Heating the element, however, does serve a purpose. Atoms other than those of hydrogen and oxygen nestle into the platinum atoms' "dimples," and some of them don't come off easily (e.g., carbon monoxide molecules adhere firmly to the surface of room-temperature platinum, thus "poisoning" its catalytic activity). Heating the material "red-hot"

eliminates such surface impurities and restores the metal's ability to initiate combustion.

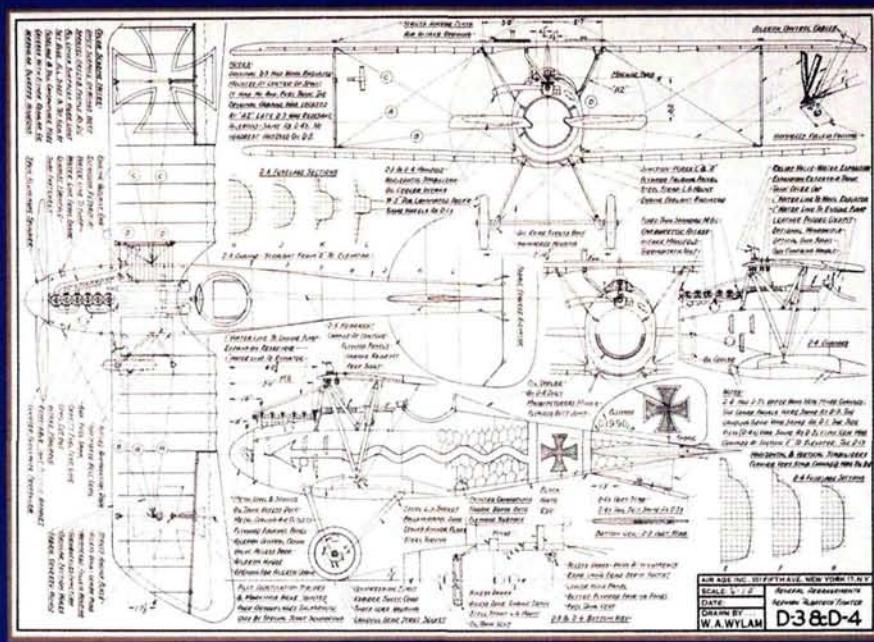
GLOW PLUG HISTORY

Model glow plugs have been on the market since 1947 in a variety of makes, styles and sizes. Curiously, some of the very best plugs ever made were among the first produced. In 1949, the plugs that were sold by the Herkimer ("OK") Company were noted for their reliability, and glow plugs made in the '50s by Champion—the spark plug people—achieved a near "ultimate" in both performance and longevity.

Champion's glow plugs were the first to have "idle-bar" construction, and this shielded their elements from the "thermal shock" of raw-fuel contact (back

(Continued on page 60)

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37 Curt Navy SO3C-1	19" x 18	28" x 32	57" x 53	Stin A Tri 42		
25 C.Racer R3C-1 & 2	11" x 15	16" x 20	33" x 30	Hindly Page 65		
34 Doug Transp DC-3	47" x 40	71" x 50	Doug DC-3 \$64			
33 Curt Hawk P-6E *	15" x 15	23" x 22	47" x 44	63" x 56	94" x 56	
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42 Boe P-40E 11-12B	15" x 16	22" x 20	55" x 52			
32 Sprfld 11-12B	15" x 16	22" x 20	55" x 52			
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35 How Mr. Mulligan	16" x 15	23" x 20	47" x 32	64" x 54	94" x 56	
33 Boe P26A Low Wing	14" x 15	21" x 20	42" x 32	63" x 45	84" x 58	
35 Stinson T-5R SR-7	12" x 11	31" x 25	45" x 38	62" x 55	85" x 50	
42 DH Mosquito Bomber	37" x 22	41" x 33	81" x 50	108" x 65		
37 Stearman PT-17 *	16" x 18	24" x 28	49" x 38	74" x 54	98" x 59	
43 N Blk Widow P-61	33" x 40	49" x 50	99" x 75			
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42 C.Helldiver SB2C4	25" x 25	37" x 35	74" x 60			
26 Ford Trimotor 4AT	18" x 18	57" x 49	114" x 72			
31 Bellanca Air Bus	32" x 22	48" x 36	96" x 52			
33 Grum J2F Duck	15" x 15	23" x 24	58" x 38	78" x 56		
27 Seawhawk F7C-1	15" x 18	23" x 24	58" x 38	83" x 50	94" x 56	
28 Sir. A. Ashib S-38	36" x 34	56" x 40	108" x 62			
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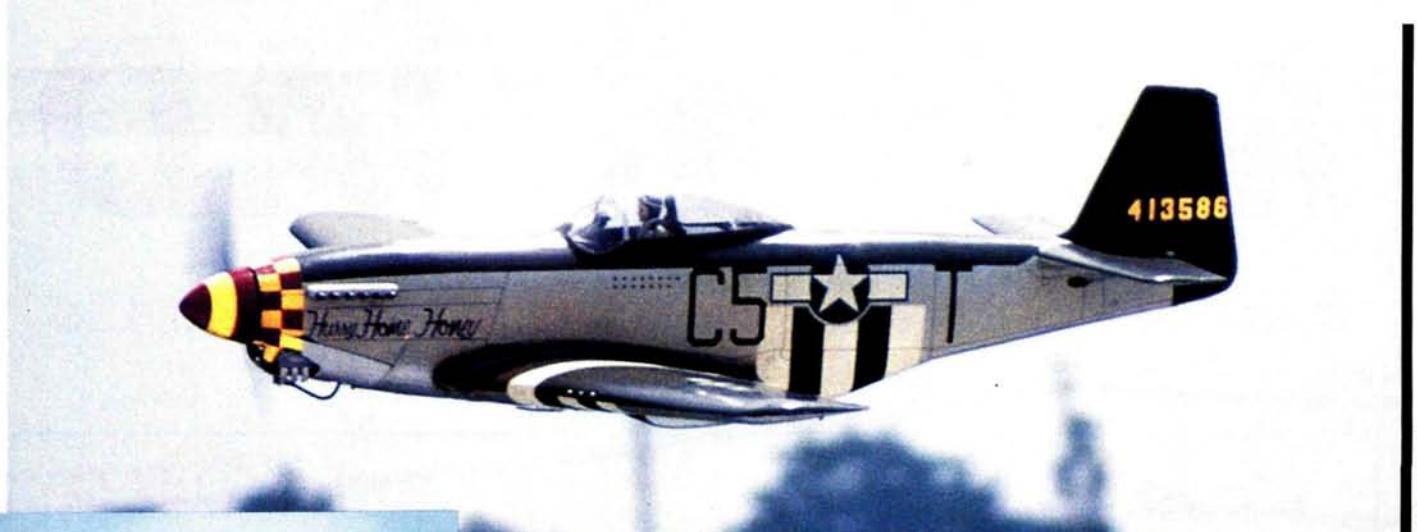
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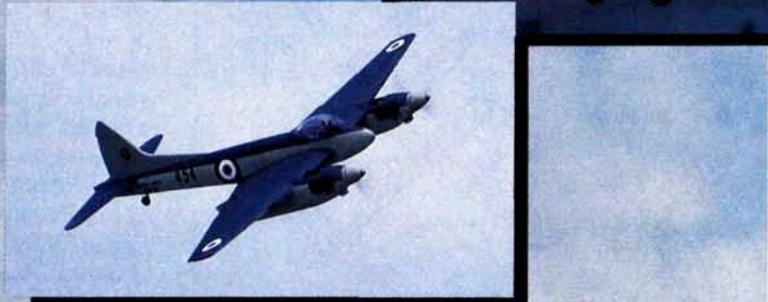
Joe Pasztor's 33-pound Nosen P-51 (with a Sachs Dolmar 5.8 engine) in a high-speed flyby.



Far left: Don Neill's 33-pound Hall Bulldog racer with Sachs Dolmar 3.7 engine.

Center: Bob Schultheis' Gipsy Moth on slow flyby.

Left: Dan Parson's deHavilland Hornet at high speed, with Frank Noll piloting.



This is one half of the pit area; note the wide grassy space!

by DAN PARSONS

THE 1990 IMAA Festival Fly-In (held on June 27 through July 1 at Wittman Field in Oshkosh, WI) was probably the first R/C flying meet that was ever helped by a cloudburst!

In their thoughtful effort to accommodate the expected huge turnout of fliers (378 signed in), officials set up two flight lines, each with five flight stations. To provide enough air space for 10 flight stations, the two flight lines were separated by at least half a mile. Unfortunately, this setup was a problem, because it also separated friends who

Oshkosh hosts one of the biggest R/C fly-ins yet!

wanted to fly together—another good idea on paper that went sour in actual practice. On Thursday night, the weather solved this problem with a cloudburst that flooded one flight line and rendered it useless. Acting quickly on Friday morning, officials increased the number of flight stations on the remaining flight line to seven. Jim Smith (Event Director) and Art Charlesworth get the credit for figuring out the frequency distribution for the seven flight stations. The following three days of flying often saw all seven stations in use, and I didn't hear of a single case of in-flight interference.

On Thursday, the first day of flying, it threatened to rain, and a stiff breeze discouraged many pilots, even though the wind was blowing right down the runway. However, one man's poison is another's dessert; so, for those pilots who are accustomed to windy flying, it was great because the waiting line was short at most stations.

The setup for frequency control was simple and effective. A pilot signed up at one of the seven flight stations and, when it was his turn to fly, he was given the frequency pin and his transmitter. What could be simpler?

As usual, the well-known IMAA flying threesome, J.W. Jones, Ben Beaird and Jack Treadman, pitted together. For the four days, J.W. flew his veteran Fleet biplane and a monoplane (I think it was a Taylorcraft). Ben Beaird put his red Weeks Special through its paces. (Who said only young men fly fire-breathing fighters?)

At least three Nosen P-51s were flown during the meet. Jim Christatos flew his skillfully. With a Q65 turning a three-blade prop, he had adequate power for slow rolls, point rolls and loops. His 1,000-foot-long low passes were quite a sight; they were 3 feet above the runway!

Joe Pasztor's Sachs-Dolmar 5.8-powered Nosen P-51 is a thundering "goer" that he has been "wringing out" for three

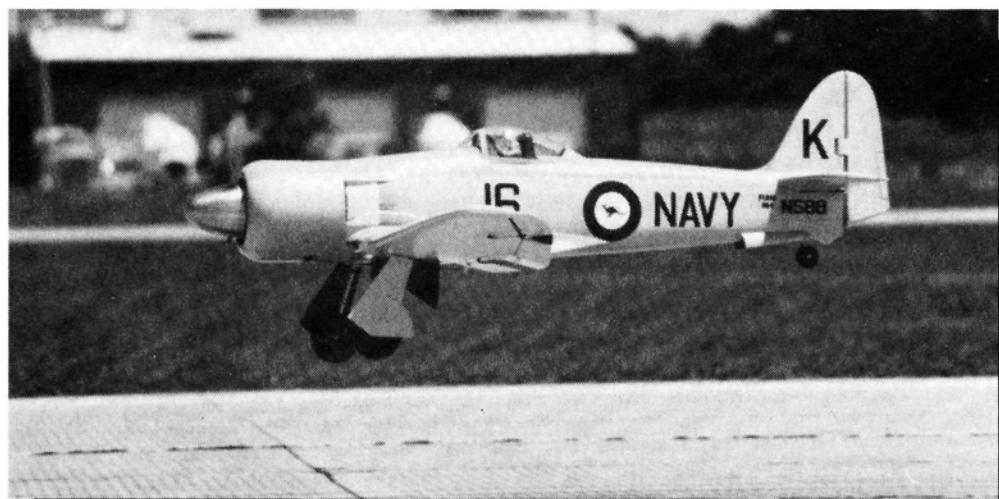


Paul Costello's Stearman up with the clouds.

elevator during pull-ups for vertical rolls after low passes.

Before he had landing-gear problems, Jim Martin managed one excellent flight with his G-62-powered Nosen P-51. He eventually got the gear to work, but then a radio problem grounded his plane for the rest of the Festival.

Don Neill (he designs and



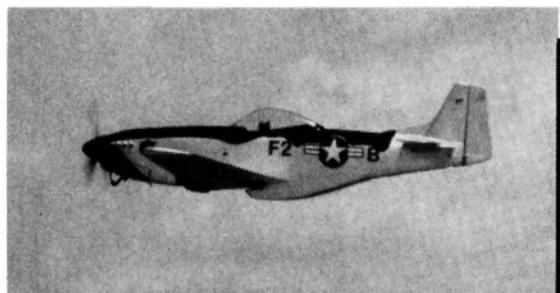
Roy Vaillancourt's big Sea Fury just before touchdown.

years. With it, Joe does things (snaps, tumbles and spins) that are out of the question with a full-scale plane. I did get him to promise to take it easy on the

builds exquisite model racers from the '30s) brought his well-known 1/3-scale Hall Bulldog and a new racer, a 1/3-scale Folkerts SK3, and George Stuckert did a

IMAA Festival '90

IMAA Festival '90



Jim Christatos'
Nosen P-51
in a close-in
flyby.

great job of flying both of them. The Bulldog was obviously a handful during landings on the blacktop runway, but George didn't make a single \$15 landing (or takeoff).

CROSSWIND FLYING

Although the weather continued to improve, the crosswinds that developed on Friday and Saturday prevented many pilots from flying. On Friday, flying was moved from the taxi-way to a much wider main runway—a big

help in the crosswinds.

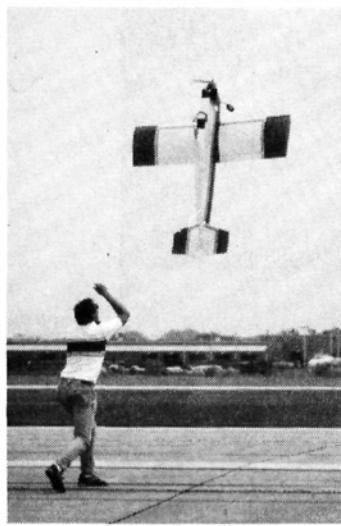
Bud Atkinson, a true pioneer of R/C scale modeling, flew his second Byron Hellcat at Oshkosh. (I saw Bud flying a 1/4-scale Mooney Mite on reeds at a '62 contest in Oklahoma City.) About two years ago, his first Hellcat actually "free-flighted" after his radio quit; it flew away and was stolen before Bud could reach it—top that one! Of the hundreds of planes in the pits, I estimate that at least 95 percent were scale—a fitting tribute to the IMAA members.

FLOAT-FLY

The Festival included a float-fly on nearby Lake Winnebago. Lloyd Roberts, that intrepid float and giant-scale electric flier from Maine, says that everyone had a fine time at the "seaplane base." About 10 Cubs and two 120 Sea-

masters took to the air. Lloyd flew his scratch-built, 1/5-scale, 104-inch Lockheed Sirius. He said the Saito 270, 4-stroke twin on "C" and "H" ignition easily pulled his 28-pound bird off the water so that he could fly it at half throttle. For three days, Lloyd flew the floats off his Sirius!

Steve Wittman has been an aviation pioneer since the '20s, both in racing and in the home-built movement. (Wittman Field is named after him.) While touring the pits on Saturday with Event Director Jim Smith, Mr. Wittman stopped to watch Frank Noll putting his Impulse Plus through its remarkable routine. (See sidebar.) At the flight line, he stood by Frank while he was flying, and afterwards, they talked at length. Mr. Wittman asked many questions about



Frank Noll's 13.5-pound Impulse Plus ST 3000 on vertical takeoff.

Frank Noll's Amazing Maneuvers

Frank Noll is one of the most gifted R/C pilots in the United States, and he repeatedly demonstrated his skill at Festival '90. He not only flew his own plane in a spectacular fashion, but he also flew at least five others—at their owners' request.

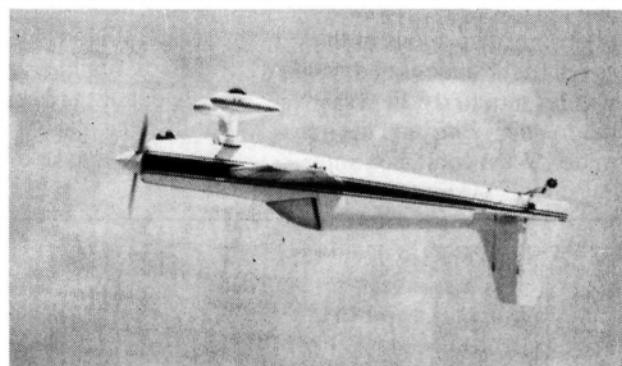
The maneuvers he put his Impulse Plus through were the talk of the entire pit area. Weighing only 13.5 pounds and powered with an ST-3000, his Impulse did things that most of us had never seen before and had thought impossible. His most spectacular maneuver was a vertical hover immediately after a very short takeoff. This was followed by a slow rotation to the left, then to the right, as the plane drifted with the wind along the length of the flight line.

Frank now holds some sort of record for having

floated three deHavilland Hornet twins at Festival '90: my veteran Hornet; one of the same size by Bob Patto; and one Dave Gauer enlarged to a 98-inch wingspan from my plans. I enjoyed watching Frank do 8- and 16-point rolls with my Hornet, plus slow rolls, huge loops, reverse Cuban-8s, vertical 4-point rolls and long, low passes. Though the almost-

new O.S. 1.08s on Dave Gauer's big Hornet tended to overheat, Frank flew it twice. He said it was worth the trip to Oshkosh just to see Dave's reaction!

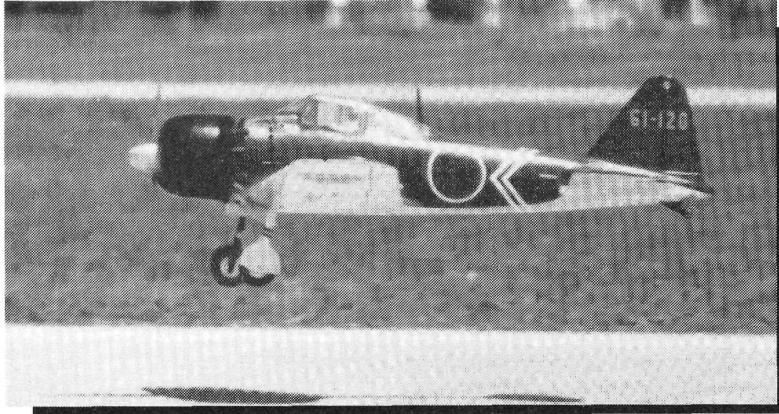
Roger Shawl brought his big Extra 230 all the way from Las Vegas, NV, so that he could watch Frank fly it. Frank obliged by putting that Extra 230 (with its G-62 up front and excellent



Roger Shawl's Extra 230 in a low, slow, inverted pass; Frank Noll piloting.

Frank's plane and how he made it perform its magic. As you can imagine, Frank was honored to have talked to one of the great

any I've ever seen with a WW II or post-WW II prop fighter. The big P-47s and Roy's Sea Fury are in a class by themselves.



Don Kanak's Baker Zero just after liftoff.

men of aviation.

Roy Vaillancourt's rare Sea Fury was big and beautiful. His takeoff runs, landings and rollouts were as perfect and pretty as

smoke system) through an aerial routine similar to Leo Loudenslager's. The perfect torque rolls and long tail slides with that Extra 230 disappearing into its own smoke were very impressive.

Allan Rychlik wanted a "different" plane, and that's what he got when he built his "Polish Fighter." He combined an FW 190 fuselage with a Calypso pattern wing expanded to 90 inches. Powered by an S.D. 3.2 and weighing only 18 pounds, its vertical performance was excellent. Allan wanted to find out what his creation could do, so he asked Frank Noll to fly it. Much to Allan's delight, Frank proceeded to perform many of the maneuvers used in the Masters and turnaround routines. Allan later commented, "...and all along, I thought it was my plane that couldn't perform!"

Twice, John Clark made long, straight takeoffs with Jim Greenly's big, 1/4-scale, scratch-built Bearcat; and twice, John had to fly it around with one of its long gear legs hanging out in the breeze. Even with an S.D. 5.8 in the nose, the Bearcat couldn't reach its speed. On the second flight, Frank Noll happened to be flying my deHavilland Hornet, so he throttled back and gave John an escort for his damaged Bearcat. As John came in for his second perfect landing, Frank provided good top cover with the Hornet—a pretty sight as he went to full power and flashed low over the Bearcat on its long landing rollout.

TWIN DUCTED-FAN FLYING

Late Saturday afternoon, Dennis Crooks flew Ralph Braun's 105-inch Cessna Citation. After solving some engine problems, Dennis rolled this big, twin, ducted-fan model right down the white line for a long, smooth takeoff. Once airborne, it was obvious that the plane had a pitch-trim problem, but it didn't take him long to get it "up on the step" and smoothed out. After several beautiful flybys, Dennis set up the Citation for landing.

During the final approach, he had another problem: the pitch control was much too sensitive.

This master of scale, twin, ducted-fan flying greased that Citation on the main gear, then he slowly lowered the nose wheel to the runway, and he rolled out as straight as an arrow for about 600 feet—what a sight! I think there were tears in Ralph Braun's eyes!

For several years, Dennis has been flying demos at big meets with his SR-71 Black Bird and F-14 swing-wing Tomcat. He



Ralph Braun's 105-inch Cessna Citation with Dennis Crooks at controls.



Joe Pasztor's Nosen P-51 on a strafing run.

flew his F-14 at the real Top Gun at San Diego's Miramar Naval Air Station in front of many of its F-14 pilots and thousands of spectators. He was also invited to fly his SR-71 at Beale AFB, CA, home base for all SR-71s.

Sunday morning was cool and clear. Best of all, there was little or no breeze, and two large, multi-engine planes were prepared for flight. First, Bob Bailey and Doug Gray put their 44-pound, Q-35-powered Ziroli DC-3 into the air. Bob did a fine job of flying this big bird, and he

(Continued on page 97)

FIFTY YEARS AGO

THE DECEMBER BEFORE PEARL HARBOR

by KATHERINE TOLLIVER



SOMETHING IS wrong with the December 1940 issue of *MAN*. It's not the cover—like his previous 11 covers, Jo Kotula's painting is vivid and imaginative. The construction article and drawing are thorough—it's not that—and the "Flash News," "Airways" and "Gas Lines" columns are, as always, informative. It's nothing specific, but, rather, an uneasy feeling that 50 years of hindsight evokes: this was the last December before Pearl Harbor.

The Grumman G-36A on the cover was a single-seat, single-engine, mid-wing, cantilever monoplane with retractable landing gear and a sliding hatch-type cockpit enclosure. With the exception of the fabric-covered control surfaces, it was metal throughout. Power was supplied by a Pratt & Whitney Twin Wasp Senior that put out 1050hp at sea level.

WINTER PROJECTS

The gas "Champ" would have made a great winter

project. Described as "one of the finest gas models in the country, with a most consistent performance," it placed in every contest in which it was entered. It could "climb with tremendous speed to a high altitude, then level off and exhibit astounding soaring qualities." With a wing loading of 10 $\frac{1}{2}$ ounces and a Super Cyclone engine, it placed first at the All Eastern States Meet.

If you were really ambitious, you could have gone on to build the Potez 63 (scale: $\frac{1}{2}$ inch to 1 foot). The full-scale Potez was a multi-purpose, three-seat plane, and the empennage was an outstanding characteristic of this low-wing monoplane. "The twin rudders remind us of the familiar Lockheed Electra, and the pronounced dihedral tail is definitely Potez." Considering the fact that the model had twin motors, it was an exceptional flier.

THANKS FOR THE MEMORIES

The article, "New Planes from the Old" must have brought back some memories: photos included a 1909 Bleriot (with a shock-abs-



This gas "Champ" had tremendous power and soaring ability.

sorbing strut landing gear) that was warming up for take-off; a 1910 Farman with the engine at the center of the wing and twin rudders; and a 1910 Baby Wright Racer with its "up-to-date" twin props, V-8 engine and twin, three-wheel landing gear. Many of these early design principles were used in the planes of 1940, e.g., the XP-39A Bell Airacobra pursuit plane, which had tricycle landing gear, cannon armament, a centralized motor placement, an in-line motor and a retractable undercarriage.

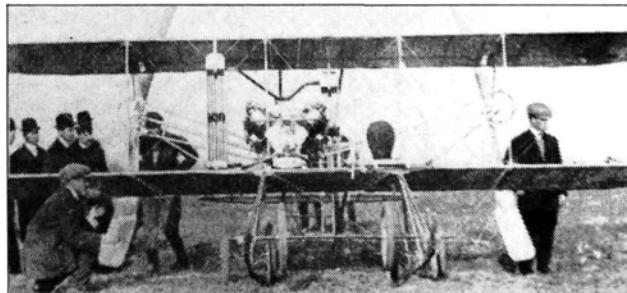
HE'S BACK

The Instructor is back. (He was *MAN*'s anonymous commentator whose articles included, "How to Meet and Influence Judges," "How to Make Money With Models" and "How To Organize a Club and What To Do Af-

ter.") This month's lecture was on originality. "It's getting so original design craft are almost as scarce as hen's teeth." (The Instructor was a funny guy.) He directs his plea for originality to the advanced flier and makes it clear that the recent growth in modeling was partly because of the good quality of the kits that were being manufactured at the time.

Here are some 1940 "stocking stuffers": a Seversky Fighter (23-inch wingspan), or a Boeing P26A, (21-inch wingspan)—each complete kit was \$2.25; 12 issues of *MAN* that came with a free, ready-to-build, all-balsa X-P Pursuit model for only \$1.50. How about "the gift that keeps on giving"?—a Super Cyclone G Series, dual-ignition engine, for \$15.

That's it for 1940. Mae West and W.C. Fields were starring in "My Little Chickadee"; Hoagy Carmichael's song "The Nearness of You" was on the charts; Ernest Hemingway had published "For Whom the Bell Tolls"; and *MAN* was 12 years old and going strong. ■



A 1910 Baby Wright Racer with twin, three-wheel landing gear and V-8 engine.

FLOATING AROUND

(Continued from page 34)

group is covered with Super-Super Coverite*, which is a dream to use. (I'm actually looking forward to covering another plane with the stuff.)

The gear legs have 1/4-inch aluminum end tabs dovetailed into airfoil-shaped cedar strips. We epoxy-wrapped these assemblies with six layers of 6-ounce cloth and three layers of West* Carbon Fibre on each side. After a day's curing, each of the four legs weighed 4 ounces, and each was impossible to deflect—even using both hands! We epoxied the gear legs into hard-point pockets in the pod and floats, and braced them with 1/16-inch music-wire X-bracing and 1/8-inch music-wire spreaders. There doesn't seem to be any slop in the entire gear system, and it only weighs 1 1/2 pounds!

ONE LAST PUSH!

We're close to the first trials! We've completed the airframe, and Mike has taken the Savoia to his shop so that he can finish the mechanics and wire the rigging. Meanwhile, I'm ordering paint and cutting out decal material for the graphics. We plan to prime the S65 with polyester

"feather fill" next weekend, install the radio gear the following week and start water trials in the middle of September. At some point, the Savoia will be color-coated with lacquer and fuel-proofed with clear polystyrene.

Then it's off to the races! Do we think we can win? We can't help wondering about it. Other competitors have been working just as hard, so close your eyes and pick a card!

There's one thing about which we're certain: if the Savoia flies, Mike and I will have solved a 61-year-old mystery and saved the reputation of one of the meanest-looking floatplanes ever. Dal Molin and Societa Idrovolanti Alta Italia at Sesto Calende would be delighted, I'm certain.

*Here are the addresses of the manufacturers mentioned in this article:

Bob Martin (Event Chairman), 1520-C Acoma Lane, Lake Havasu City, AZ 86403.

Bob Hirsche's Scale Plans, 8439 Dale St., Buena Park, CA 90620.

Airtronics, 11 Autry, Irvine, CA 92718.

Robart Mfg., P.O. Box 1247, St. Charles, IL 60714.

Ace R/C, 116 W. 19th St., Higginsville, MO 64037.

Coverite Products, 420 Babylon Rd., Horsham, PA 19044.

West Carbon Fibre; distributed by John Sullivan Float Products, 1421 Second St., Calistoga, CA 94515.

ULTIMATE BIPE

(Continued from page 53)

FUSELAGE

Cut the fuselage sides out of medium-hard, 1/8-inch balsa. You'll have to splice some sheets together to achieve the 5-inch height. Add the 1/8-inch balsa doubler going from the firewall back to F-4. Cut the cabane shelf from 1/8-inch ply, cut the servo holes in it, and add the 1/8x1/4-inch servo-mount doublers. Glue 1/8x1/4-inch longerons, verticals and diagonals to the fuselage sides aft of F-4; then make the firewall from 1/4-inch ply. Drill holes for the motor mount, the throttle cable and the fuel lines, and install the blind-nuts (add epoxy). Glue the firewall to fuselage sides and add the gussets. Fab up F-2 and F-4 and glue to the sides. Mark and cut the wing saddle, and add wing-saddle doublers. Add F-3 and vertical-grain doublers to reinforce the pushrod exits.

Fit and glue the cabane deck, and add the rear 1/4-inch square cross-braces with the tail pieces drawn together. Add the bottom diagonals, and cut and glue the tank shelf and gussets. Bend up a duplicate pair of cabane struts out of 1/2x.032-

(Continued on page 73)

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BACK TO PAGE

QUIET FLIGHT

Changes, projects and "towing the line"

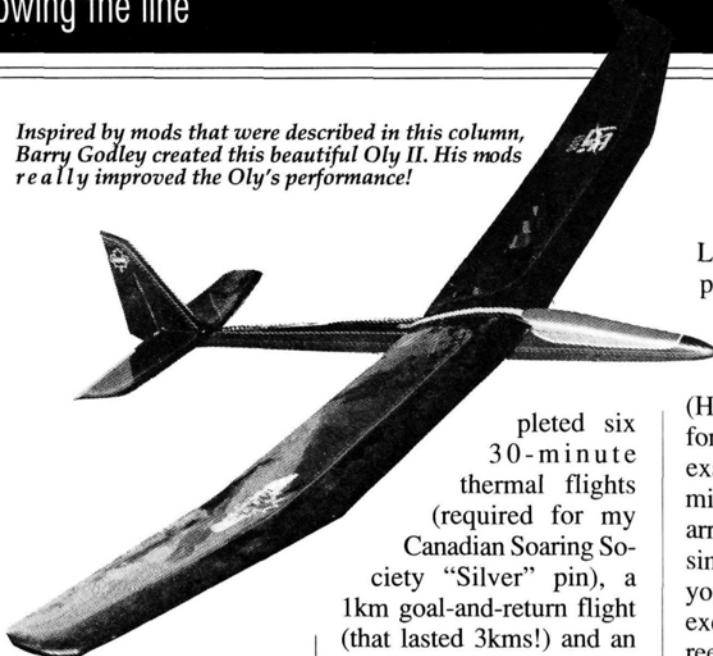
by JOHN LUPPERGER

MY PREVIOUS project planes (Wanderer and Sophisticated Lady) were very popular, and I received many letters from people who tried the construction ideas. Barry Godley of Medicine Hat, Alberta, Canada, didn't build either of the project planes, but he took the concept of modifying an existing kit and applied it to the Airtronics* Oly II. Barry's color prints might not convert well to black and white but, believe me, this is the best-looking Oly I've ever seen! I'm sure you'll get an idea of what Barry did from his letter:

"I really enjoy your column. It gives me just the right mix of soaring info, data, product news, etc., that I need to know as I grow in the sport of R/C soaring. In particular, the articles on modifications and improvements to available kits are helpful.

"Following your lead, I decided to do something with an Olympic II kit I had lying around. The Oly's nose/hatch isn't aesthetically pleasing, so I lengthened it and made it smoother and sleeker. The hatch consists of layered balsa that curves up and over the wing's leading edge. The central wing dowels look better than cross-fuselage dowels, and they reduce parasitic drag slightly. I recessed the tow

Inspired by mods that were described in this column, Barry Godley created this beautiful Oly II. His mods really improved the Oly's performance!



hook and added a small sub-fin/tail skid.

"The wings required the most work! I swept the polyhedral sections back more than was shown on the plans (à la Sophisticated Lady), and I sheeted the open-section frame wings on the top and bottom leading edges to create a D-tube leading-edge section. I painted all the leading-edge bays with resin (from root to tip) before I added the bottom sheeting. I sanded in Phillips-Entry along the entire span, and then completed the modifications with Rutan-type winglets at the tips. Oh yes, following Dave Thornburg's suggestion in his new book, I changed the rudder, too. If I had to do it again, I'd make the wing rods bigger and add top/bottom sliding fence-type spoilers.

"As for flying, this plane is sleeker and faster than the original. I recently com-

pleted six 30-minute thermal flights (required for my Canadian Soaring Society "Silver" pin), a 1km goal-and-return flight (that lasted 3kms!) and an unwitnessed 65-minute thermal flight! Although it flies in a good wind and is easy to spot-land, it would be better with spoilers. I know it's only an Oly II, but you'd be surprised how well it can fly!"

From Barry's letter, you can tell there's a great deal of satisfaction in transforming a stock kit into something "more." With his modified Oly II, Barry's flight achievements are impressive. I wouldn't say the Oly couldn't have accomplished them without the mods, but I'm sure they made a difference in the plane's performance.

I'm trying to decide which plane to use for the next project. I'll decide before the next issue, but I'd like to hear your suggestions.

HAND-TOWING AGAIN

As promised, I've found a source for the Graupner* hand-tow winches! I bought one

of these units when I was in England for World Interglide, and David Martin of Hobby Lobby* has agreed to import them. This hand-tow winch is a good unit, and it isn't expensive. (Hobby Lobby will sell it for about \$35 to \$40. The exact price will be determined when the first order arrives from Germany). It's similar to the one I showed you in an earlier column, except that it has a plastic reel. The gear ratio is 8:1, and it brings the line in quickly.

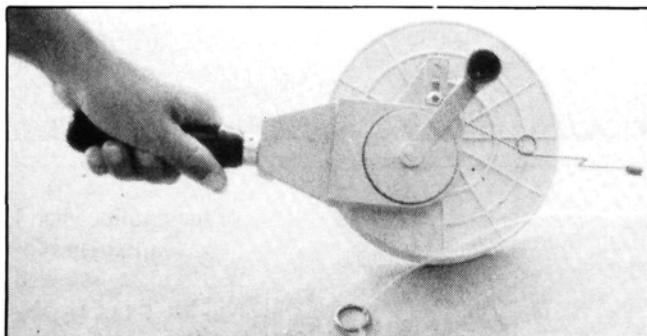
I received a letter from Pancho Morris of Mesquite, TX, about his club's hand-towing activities. Pancho made interesting observations during his club's first F3J event:

"I enjoyed your article on hand-towing, and I wanted to report that, here in the Dallas area, we've already held our first, informal, test-run, F3J contest. It's a great format because of the man-on-man scoring, the ease of running, and there's the absence of any equipment hassle! Hand-towing could equalize the launches of the strong, high-performance ships and the lighter planes.

"To eliminate the need for 'fancy' hand reels at the first trial meets, we just used a large dowel for a handle and left the lines lying on the field. We used 80-pound monofilament

(Continued on page 72)

QUIET FLIGHT



The sturdy Graupner hand-tow winch will be available from Hobby Lobby International.

line. To launch the planes, we signaled the tow person to run and, when the slack was out of the line, we held onto the plane while he stretched the line. When it reached the desired tension, we threw the plane hard.

"The line develops a lot of 'pull,' but if you hold on to it until you can't stand it while the tow person spins his wheels, the plane zooms out of your hand! When it assumes a climb angle and there's a breeze, the tow person can slow to a walk, or even stop and hold the plane against the wind. This works even with the heavier-aileron ships. Flaps have proven to be a definite help, and we've launched everything this way including Falcons, Bounty Hunters and Windsongs.

"You made one statement that I don't agree with; you said that the small, lighter ships can be launched more easily." (JL: actually, I stated that 2-meter ships were easier to launch in both calm and breezy conditions, not that they were easier to launch). "We think that the big, light ships are the easiest to launch because they have more wing area." (JL: also more drag).

"Recently, on an evening when conditions were calm, we launched using one of

the super-strong high-starts that provide a brief but strong pull. We decided to hand-tow and actually had better launches! (This was with a Falcon 880, a new Southwind and my own, heavy, 2-meter design.)

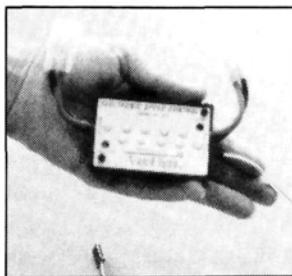
"We held our first F3J meet in almost calm conditions and 100-degree temperatures. We had 14 fliers and all went well, especially for the floaters. (Because of the conditions, the heavier plane's launches weren't as good.) Large floaters like Windrifters and Olys had the best launches, and there was great lift and many maxes—often with all four planes in the same thermal! "We plan to hold a meet in the Fall, and then to put an official F3J event on next year's contest schedule. We're pleased to see this event publicized, because it's exciting and a great way to launch sailplanes (one we've forgotten about in this country)."

Thanks for the kind words and report, Pancho. I hope your club's activities will encourage others to try F3J and hand-towing.

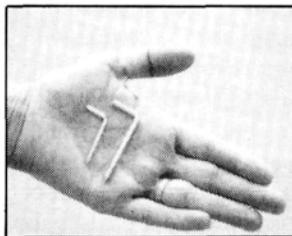
INEXPENSIVE TOW HOOKS

The other day, I was getting supplies for some "honey-do's" when I dis-

covered some great tow hooks. They're "square-bend" screw hooks that come in three sizes and would be great for 2-meter, standard and unlimited-class ships (I only bought the two smaller sizes). They come in packs of four, six and eight, and only cost 69 cents. Their only drawback is that the threaded part of the shank is rather high and might require a tall tow-hook block for a good anchor. If you're having trouble finding good hooks, try these. They're available at any hardware store, and you can't beat their price!



Astro Flight's Hi-Rate ESC features all the latest technology. It handles up to 50 volts and includes a brake.



These inexpensive "tow hooks" are square-bend screw hooks from a hardware store—you can't beat the price!

NEW SPEED CONTROLLER

Astro Flight* has released its Hi-Rate Electronic Speed Controller. The model (no. 205) has a high-frequency switching rate of 2500Hz, a continuous-amp rating of 100 and a surge rating of 700A. Its maximum voltage capability is 50V, the brake's peak

amperage is 200, and it's available with either Futaba-J* or Airtronics connectors. I'll mount this unit in my AFI Porterfield with a geared Astro 25 Cobalt.

The Hi-Rate has state-of-the-art technology. Its optical-coupling will eliminate the transference of the motor noise to the receiver, and its high-frequency switching means that motors will run cooler, brushes will last longer, and ferrite-magnet motors won't lose their magnetism as quickly. The high switching rate also produces longer run times when you use partial throttle. Its signal filtering produces a "soft" start that's easier on gear-drive units and can avoid the sudden snap roll that's sometimes produced when you power-up during a low, slow approach. The unit also features built-in voltage doubling so the Mosfets will operate at full efficiency, even on six cells. It has five IRF-Z40 Mosfets for forward and four IRF9-Z30s for braking, and it has neutral and gain adjustments. It sounds impressive, doesn't it? I'll let you know how it works under flight conditions as soon as I finish the Porterfield.

Till next time...good thermals and a full charge!

*Here are the addresses of the companies mentioned in this article:

Airtronics, Inc., 11 Autry, Irvine, CA 92718.

Graupner; distributed by Hobby Lobby International, 5614 Franklin Pike Cr., P.O. Box 285, Brentwood, TN 37027.

Hobby Lobby International, see above.

Astro Flight, Inc., 13311 Beach Ave., Marina Del Rey, CA 90292.

Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718.

ULTIMATE BIPE

(Continued from page 69)

inch brass, drill the top nut holes, and quick-solder the self-locking nuts. Drill holes in the cabane deck, install the cabanes with blind-nuts, and apply Loctite*, or CA, so that they'll never come loose. Use clothespins or clamps to hold the brass X-braces, and check the alignment before soldering.

Cut and glue the top fuselage formers. Soften the top planking with water and ammonia, and add the cockpit floor *before* the top planking. *Do not* glue the balsa chin plate until the bottom wing is ready to install. You'll need this access to drill F-2 for the wing dowel. Sheeting the fuselage top is best accomplished in sections: the area forward of the cockpit is done with four pieces—one to each curve outside of the cabanes and two fitted between them. To soften the fibers and to prevent splitting, soak the curved panels in a 50:50 solution of ammonia and water. From the headrest back to F-8, you might become frustrated with the paneling because of the compound curves. Again, ammonia and water are necessary, along with a lot of fitting before gluing. Some filling will probably be necessary before final-sanding.

Now, let's do the tail feathers, working over the plans. Make up the vertical and horizontal fins, the rudder and the elevator halves. Don't forget to make that horizontal-stab 2-degree shim. I made mine by cutting a piece of $\frac{3}{16}$ x4-inch balsa to shape, then tack-gluing it to the bench and hitting it with a belt sander until it was a $\frac{1}{8}$ -inch "chisel" shape.

I don't usually glue the tail feathers into place until I've sanded them, rounded the corners, made the hinge slots, and covered them. It's your choice, though. You'll still have to make and cover the tail gussets. Trial-fit all the pieces before covering or gluing them.

The canopy is a cut-down, salvaged, canopy from a 40-60 size EZ Chipmunk. They're available, but I bet that the better hobby shops will have something that fits and looks good. After covering the fuselage, glue the canopy on with Dap's RC-56 Wilhold glue. The pilot is a $2\frac{3}{4}$ -inch Williams Bros.* Sportsman.

COWL

To make the cowl from balsa, cut and laminate three $\frac{1}{4}$ x3x6-inch pieces together, and glue another $\frac{1}{4}$ x $\frac{3}{8}$ x6-inch piece to the bottom for the nose piece. (This requires a lot of carving and sand-

(Continued on page 77)



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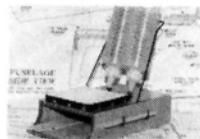
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SPORTY SCALE

TECHNIQUES

by FRANK TIANO

3-Views and Plans, Rivets, Projects, and Top Gun

BOY, WHAT AN outstanding time I'm having! Over the past few months, I've received more than 25 letters with pictures of the neat stuff you've been building! So, even though I usually try to cover a variety of issues in my column, this month, I'll show you just *one* new product and mention only *one* thing that's "got my goat"! There won't be a "how-to" department, but I will show you some fabulous airplanes!

PEEVED

EVERY once in a while, someone I know complains about a plane he's building from a kit or plans. There's nothing worse than making it half or three quarters of the way through framing only to discover



Paul Harding's 100-inch, 24-pound Hudson uses two Super Tigre .90s, sports homemade retracts and drops a bomb load.

that something is wrong—you know: a wing is too long; too much dihedral was built into the tail; the cowlings aren't deep enough; the canopy is the wrong shape; or whatever!

Why don't some manufacturers and plan designers take the time to evaluate the three-view drawing they use to design a new model? And why do others use two or more three-views? It's very difficult for modelers to build an accurate scale model of *anything* if the dang plans are full of errors!

I'm certainly not crucifying any designer for making errors; we all do, and I probably make more than most! But when I see that the part of a fuselage that's be-

hind the canopy doesn't line up with the part *in front* of the canopy (especially when thousands of photos show it does!), I get very nervous! Evidently, so do many of you.

The solution is simple. I ask all designers to please, please, please note on their plans the specific three-view drawing from which the model was designed.

One more thing: if you receive a set of plans that are totally unsuitable for your needs, any reputable person or organization should take them back and refund your money—provided you offer an explanation and pay the return postage. To understand what I'm talking about, look at the photo.

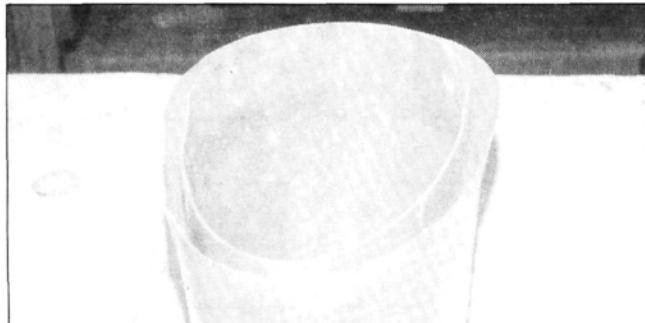
PET PROJECTS

YOU'LL probably never see a cleaner P-47 than the one built by Franz Meir-Patton of Switzerland! Franz chose the color scheme of the 58th Fighter Group. Stationed in England during WW II, its planes' identifying features included a black-and-white checkerboard cowling. The model spans 93 inches and might have been built from a set of Vaillancourt plans. I do know that Franz uses a Sachs 4.2 for power.

You have to admire anybody who scratch-builds, especially when, like Jim Baxter (of Spokane, WA), they do a super job. His new TA-154 Mosquito was photographed by Mike Richardson. Jim certainly created something unusual; he even designed and built the retractable landing gear!

I don't know how large Spokane is, but I bet Jim knows a fellow by the name of Paul Harding. Mike's camera caught Paul's new airplane, a Lockheed Hudson, sitting in the grass at a local contest. I'm told that Paul went "all out" on this model, which also features home-

(Continued on page 78)



Gripe of the month: both fiberglass cowlings are for 1/6-scale, 81-inch P-47 Thunderbolts, but neither is accurate to the best known P-47 3-view drawn by DuVal.



Franz Meir-Patton's ultra clean P-47. Does it need a little scale weathering?!

ULTIMATE BIPE

(Continued from page 73)

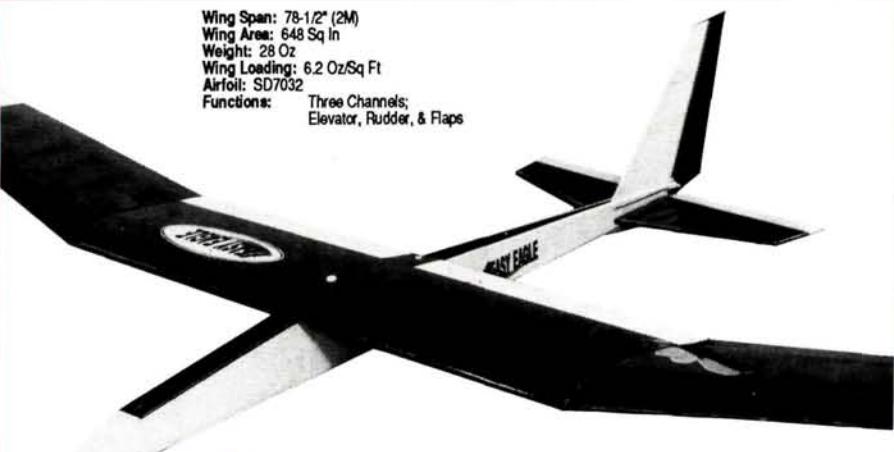
ing later.) You'll have to build a temporary construction profile jig and remove it after the skin and chin plate have been added. This jig is glued to the nose piece, and the other sections of the cowl are built around it. Once the entire cowl has been skinned and sanded to its final shape, remove the jig and open the air passages. Before painting, trim off the excess wood in the gussets and corners to reduce weight as much as possible. To fuelproof the wood and provide a smoother base for paint, apply a coat of finishing resin inside and out. Cutting, carving and sanding the cowl to final shape takes about six hours. To make this job easier, use a Dremel tool and an orbital sander. I had to put a block of scrap balsa in the corners that I had sanded too deeply. When I needed a gusset around the bottom, I built up the area with a paste of resin and sawdust, and I filled in the scratches with Model Magic* before I applied the resin coating. Producing a good-looking cowl is the most labor-intensive job on this aircraft. After it has been sanded smooth, you must cut it as necessary to hang a muffler on the motor.

The landing gear is made of $\frac{5}{32}$ -inch music wire, and I used Dave Brown's* Lite-Wate wheels. The Ultimate is a hot machine, and thinner wire isn't strong enough. Use your choice of covering as long as it's blue with yellow trim! I used fabric, but if I make another Ultimate, I'll use film. My plane weighs 7 pounds, 3 ounces, and has a wing area of 858.5 square inches. This gives a wing loading of 19.295 ounces per square foot—darn respectable for a biplane. A few ounces could be saved by using a lighter prop, a plastic spinner, film covering and a simple wire

(Continued on page 83)

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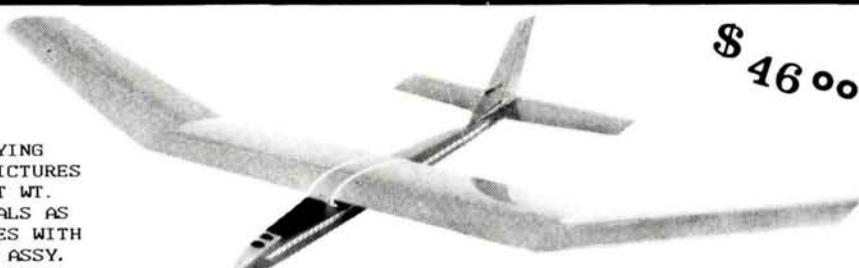
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SPORTY SCALE



Made from a Pica kit, this Waco shows how effective a good MonoKote job can be on a fabric-covered airplane. Stan Zdon, the builder, hails from Coon Rapids, MN.

made retracts. I just wish the grass were shorter, Mike! If those two twin-engine subjects aren't "different" enough for you, take a peek at Len Bosman's Lancaster bomber. Len lives up in the Northwest, too (Vancouver, I think), and he built the "big bomba" around a pair of Quadra 40s. The other two engines must be dummies with free-wheeling props. This project is unusual enough, but consider that Len uses a simple 5-channel radio! The plane has scale retracts, and I can only guess that the flaps are inoperative.

Stan Zdon sent me pictures of some planes he recently completed. To duplicate the pleasing lines of a Waco YMF-3, Stan modified a Pica* 1/6-scale kit, and it's nice to see that he took the time to document his subject properly. His Waco is a replica of the full-scale airplane built for Alice Du Pont of Du Pont paint fame! Even though the plane's exterior isn't entirely scale, you must admit that the MonoKote and Formula-U finish looks not only scale, but also flawless!

Obviously, Len likes bipes, because his other airplane is a beautiful 1/6-scale Tiger Moth built from a Pilot kit. He duplicated the outstanding finish with Permagloss Coverite and applications of Sig dope for the yellow areas, Formula-U for the green and Perfect paint

for the brown! (If you'd like to send me photos for the column, ones like Len's are just what I need!)

ROSIE THE RIVETER?

Any true scale fan should recognize Jeff Foley's name: he has competed in almost every major scale contest in the country and currently writes a scale column in *RC Report*. Some time ago, Jeff formed Model Engineering*—a company that builds all types of models for hire, but primarily wind-tunnel test models for the big guys—McDonald Duckless and Cheneral Dynamix! Model Engineering has just released its second hobby product. (The first was the neat, aluminum, self-adhesive sheeting for panels, etc., that I told you about a few issues ago.) The new product is called, simply, "The Riveter." It allows even the most uncoordinated modeler to apply perfect rivets in minutes using

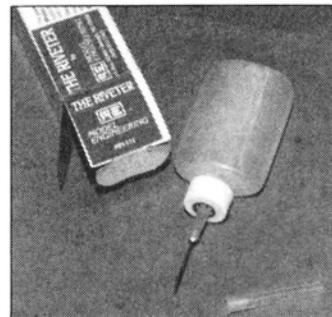


Jim Baxter's 14-pound, scale, TA-154 Mosquito has a 77-inch span and is powered by two O.S. .60 engines.

inexpensive white glue and water! This is an excellent tool, and many of us have used it for years. If you'd like one, just send \$6.85 to Model Engineering. The Riveter will probably never be advertised, and there isn't a product sheet. In other words, don't write for more information, because there isn't any!

TOP GUN VACATION?

That might not be a bad idea! More and more scale fans are making the Top Gun Invitational* a family affair, and that's exactly what the TG board had in mind from the start. In May, when other parts of the country are digging out af-



The Model Engineering Riveter allows you to make lots of rivets in quickly. Erase any errors with a damp rag.

ter winter, Florida offers some of the most pleasant weather you could hope for—80- to 85-degree days and 65-degree nights!

Top Gun provides plenty of competition and lots of airplanes to go gaga over during the day, and there are classy cocktail parties and a dinner dance in the evening. Once again, *Model Airplane News* and Pacer Technology are the hosts, and, once again, this will be the year's only real, true-scale contest with a considerable cash purse.

Top Gun invites only worthy pilots and builders, and every model is a work of art. Last year, we introduced Team Scale for those who like to compete but prefer the more relaxed condition of having a full-time partner. The 1991 Team Scale entrants include some outstanding aircraft and pilots. Nick Ziroli will team up with Bill Steffes

Len Bosman's Lancaster spans 11 feet and is powered by two Quadra 40s.



Stan Zdon's 1/6-scale Tiger Moth, which qualified for Scale Masters competition, uses a K&B 61 engine and an Ace Silver 7 radio.

ULTIMATE BIPE

(Continued from page 77)

tail gear, but my biplane gets unlimited vertical flight as is.

Assuming you followed the plans, final assembly involves a minimum of measuring and fitting. The interplane struts need a separate explanation, though. The struts must be *loaded* when installed. They should be $\frac{1}{4}$ -inch *longer* than the space between the two wings. This holds them in their slots by compression and eliminates the need for attachment bolts.

FLYING

For positive lubrication under extreme loads or lean runs, I tanked up with 12 ounces of Duke's fuel from Fox Mfg. This stuff is 10-percent nitro and 20-percent castor oil—a return to the days of yesteryear. After the Fox 74 fired up and settled into a beautiful idle, I had a little problem. I couldn't get a quick transition from idle to full speed. If I advanced the throttle slowly, it worked, but in the air, a pilot tends to pop the throttle when he wants to go around. This caused a couple of flameouts, and straight-away landings into the beans. The following day, I installed a

(Continued on page 91)



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FLITECRAFT

SHADOW

A good sport ARF for intermediate fliers

ARF

by JOE BESHAR

**SPECIFICATIONS**

Type: Sport ARF
 Span: 57 inches
 Weight: 4 pounds, 12 ounces
 Area: 495 square inches
 Wing Loading: 22 ounces per square foot
 Power Req'd: .40cc sport engine
 No. of Channels Req'd: 4
 Sug. Retail Price: \$115.95

Features: Molded fuselage; finished foam-core wings with symmetrical airfoil; hardware accessory package

Comments: The Shadow is a rugged ARF that looks pleasing. It isn't for beginners, but intermediate fliers will enjoy its sporty flight qualities.



PHOTOS BY JOE BESHAR

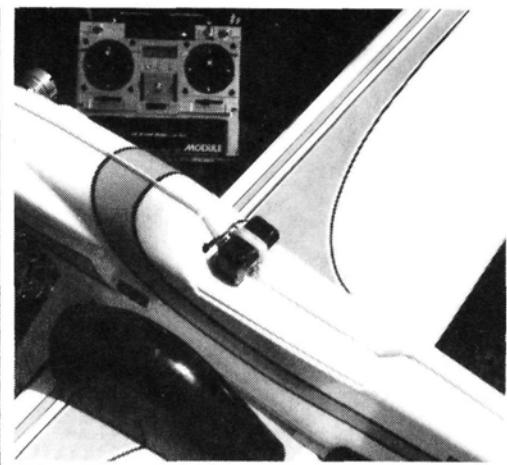
“A STICK-and-tissue or silk builder, building an almost-ready-to-fly airplane! What happened?" I told Rich Uravitch that I had bought my first ARF, and that was his surprised response! My explanation? During a demonstration fly-in for students at the Saddle River Day School, I had carelessly flown my model toward the sun. Of course, the sun blinded me, and my plane ran into a large tree at full throttle. Total destruction!

I needed a model to fly, because after we had waited for two years, our county flying field—Bergen County Model Airdrome—had just become operational. Coincidentally, the Flitecraft* Shadow came to my attention. I liked its looks: with its racy, low-wing design, double-taper wings and wheel pants, it reminded me of the Laser. Its price? I compared it with other ARFs, and I found it cost only half as much as some of them. As well as this, it was made in the good old USA, so I just had to order one.

SHADOW



Joe proudly shows off his new Shadow. The only silk *might* be in his shirt!



The airborne battery pack is held in the cockpit area by a rubber band. The canopy (dark object in foreground) is removable for access.

For power, I chose another home-grown item: the recently released Fox*. .40 (model no. 24096). It, too, was inexpensive in comparison with others, so my entire package cost less than \$130 (purchased at typical dealer discounts).

THE KIT

The Shadow comes well-packed, and most of the required material is included.

You have to supply the two clevises and pushrods for the ailerons, an engine, a fuel line, a prop, a spinner, a radio, a fuel tank, connectors, foam saddle tape and adhesive.

The kit is generally well-made, but I didn't like the construction of the rudder and stabilizer assemblies. These are cut from $\frac{1}{4}$ -inch, flat, foam-core laminate board, and the foam is exposed at the cut edges. I recommend that

you coat these edges with a layer of epoxy or a veneer of plastic to make them resistant to fuel and debris. They seem to be rather delicate, but they haven't been a problem so far.

Steel capscrews are supplied for the wing and landing-gear hold-downs. Although these are satisfactory, it might be better to replace them with nylon screws, which will shear easily on a hard landing.

A formed-foam "doughnut" is supplied for tank installation, but it didn't hold the tank securely. The tank had a tendency to cock at an angle in the "blind" area where it's installed at the front of the fuselage. To remedy this, use foam of twice the supplied thickness. I also doubled the thickness of the doughnut by using an additional piece of foam. This works very well: it stabilizes the assembly and holds the tank firmly.

THE FOX .40 ENGINE

SPECIFICATIONS

Bore: .840 inch

Stroke: .715 inch

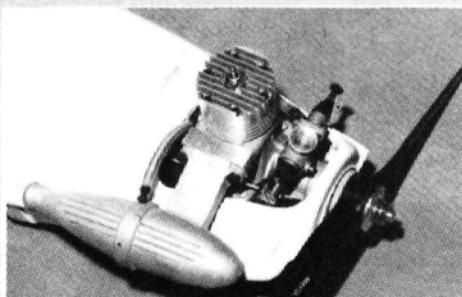
Displacement: .396

cubic inch

Rpm: 13,000 with a 10x6 prop

Weight: 9 $\frac{1}{2}$ ounces (without muffler)

Price: \$94.95



This engine looks more impressive than its Fox predecessors, as its exterior is machined and well-cast, so it has no protruding flashing or signs of "sand-casting" on its surface. It has ball bearings and a lapped, cast-iron piston; it's also available with an ABC cylinder-piston arrangement (part no. 24098). The manufacturer says that the performances of the two engines are very similar. For those on tighter budgets, there's also a standard model that has bushings instead of ball bearings.

Fox Mfg. tells you to take the engine out of the box and run it, and that's exactly what I did! I installed a 10x6-inch propeller and then fired up, using FAI 3-percent-nitro fuel. The Fox started immediately; it produced 13,700rpm and idled solidly. This is an excellent performance that exceeds the specified rpm. I was just as impressed with the engine's ability to idle right out of the box without break-in.

ASSEMBLY

The well-written instructions contain good, sequenced, step-by-step illustrations to make assembly easy.

The materials used are compatible with CAs, so assembly goes quickly. The construction details have been well-thought-out, and I was particularly impressed by the

RC VIDEO REVIEW MAGAZINE

Vol. 5

Vol. 5: In-depth kit and product reviews, building segments, and exciting flying scenes featuring:

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method used to mount the aileron servo. This servo, which is usually mounted vertically, is mounted horizontally to the plane of the wing with a protruding, vertical, stilt assembly that uses a criss-cross arrangement of the aileron pushrods. This configuration works well: it minimizes servo height, so it eliminates the need to cut into the wing's center section (the usual solution).

Because of space constraints, I didn't mount the battery in the fuselage as instructed; instead, I used the space under the canopy. This is where I mounted two hold-down hooks to which I attached the rubber bands that hold the battery. I didn't glue the canopy into place, but I cut two angled slits in the fuselage spline so that the canopy can be slid in from the side and snapped into the fuselage cavity to make everything completely accessible.

To use the Fox engine, I had to extend the muffler base by $\frac{3}{8}$ inch. To do this, I made a spacer from $\frac{3}{8}$ -inch-thick aluminum sheet. I cut the exhaust-port profile and drilled holes to extend the muffler mounting so that it would clear the fuselage properly. This allows the engine to nest nicely in the fuselage cavity. In addition, because of the length of the engine mounts included in the kit, I put an $\frac{1}{8}$ -inch spacer on the propeller shaft to enable the propeller to clear the front cowl. A washer made of $\frac{1}{8}$ -inch plywood works well when slipped onto the prop shaft. With these minor modifications, the engine fit perfectly into the pre-molded fuselage.

How long did it take me to do all this?—only $10\frac{1}{2}$ hours!

PERFORMANCE

After test-running the engine for about 2 minutes, I set off for the recently opened Model Airdrome, where I planned to give the Shadow its first flight. To my delight, its flight characteristics were outstanding: it penetrates perfectly and has performance features that are ideal for aerobatics.

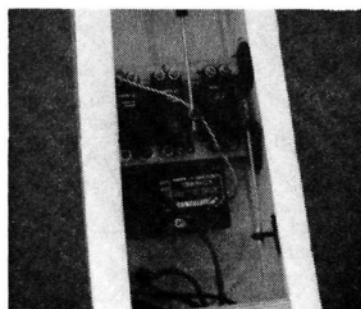
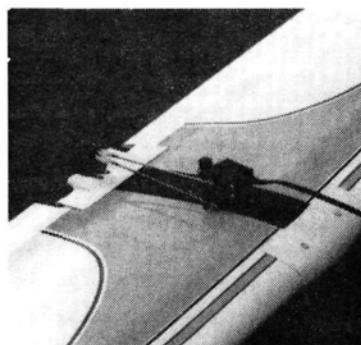
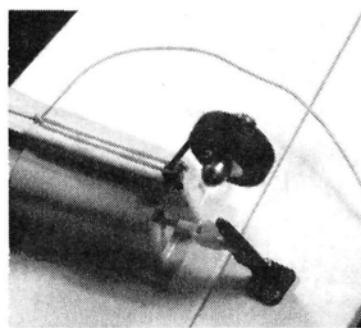
I don't suggest the Shadow as a trainer model, but rather as a step to a first low-wing model. Its performance, especially with the Fox .40, can accurately be described as brisk!

So that's it!—my first ARF experience. I enjoyed it! (I trust that it will in no way affect my image!) Now, back to my OT-assist and lots of sticks!

*Here are the addresses of the companies mentioned in this article:

Flitecraft; distributed by Great Planes Model Distributors, 1608 Interstate Dr., P.O. Box 4021, Champaign, IL 61820.

Fox Mfg. Co., 5305 Towson Ave., Fort Smith, AR 72901.



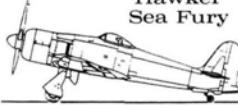
Top to bottom: ■ Underside details include wheel pants, gear-attachment method and a nearly ideal muffler-exhaust location. ■ Lower aft fuselage showing tail-wheel installation.

■ The aileron servo mounts above wing surface, so eliminating the need to cut into the center section.

■ Completed radio and pushrod installation. There's enough room for any modern system.

HAWKER HURRICANE

Wingspan 92 in.
Wing Area 1420 sq. in.
Length Overall 74.25 in.
Weight 18-24 lbs.
Engine . Quadra Q-35, Q-40, similar
All-wood construction; no foam used. Cowl,
canopy & spinner available.

Hawker Sea Fury

Wingspan 90 in.
Wing Area 1800 sq. in.
Length Overall 81 in.
Weight 28-32 lbs.
Engine ... 3.4 - 4.2 cu. in.
All-wood construction... no
foam used. Cowl, canopy &
spinner available.

P-47 THUNDERBOLT

Wingspan 92 in.
Wing Area ... 1780 sq. in.
Length Overall 78 in.
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INTRODUCTION TO

SCRATCH-BUILDING

by DAN SANTICH



•Top: The Robart Incidence Meter, a drafting triangle and a steel straight-edge are necessary for accurate model building.

•Middle: The extremely useful Dremel Table Saw and Belt Sander.

•Bottom: To trace a part, you can use type-writer carbon paper.

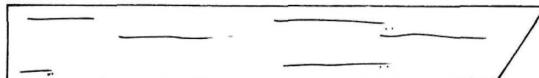
TOOLS CHECKLIST

- | | | |
|---------------------------------------|---|---|
| <input type="checkbox"/> vise | <input type="checkbox"/> knives | <input type="checkbox"/> triangle |
| <input type="checkbox"/> wax paper | <input type="checkbox"/> razor blades | <input type="checkbox"/> first-aid kit! |
| <input type="checkbox"/> table sander | <input type="checkbox"/> sandpaper | |
| <input type="checkbox"/> pins | <input type="checkbox"/> glue | |
| <input type="checkbox"/> hand drill | <input type="checkbox"/> ruler | |
| <input type="checkbox"/> saw | <input type="checkbox"/> metal straightedge | |

Building from plans can be easy and fun

In 1987, we published four articles on scratch-building, and they were so well-received that we've decided to run them again—this time, in two parts. Author Dan Santich makes a convincing case for scratch-building and shows you how, so you can go right from this article to our Plans Directory! Who says you can't do it?!

HOW TO READ YOUR PLANS



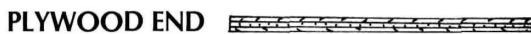
BALSA SHEET SHOWING GRAIN DIRECTION



BALSA END



PLYWOOD SIDE



PLYWOOD END



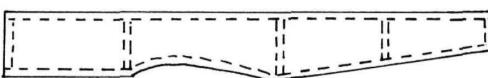
HARDWOOD SIDE



HARDWOOD END



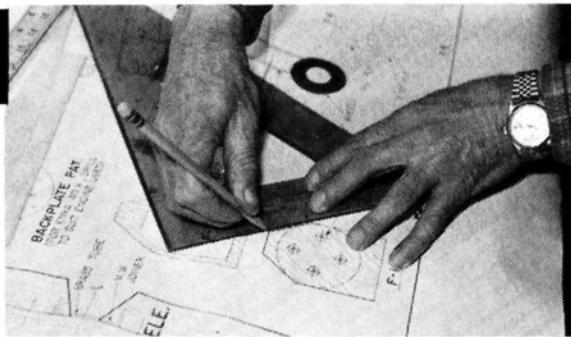
TRIANGLES SHOW MAJOR PART OUTLINE



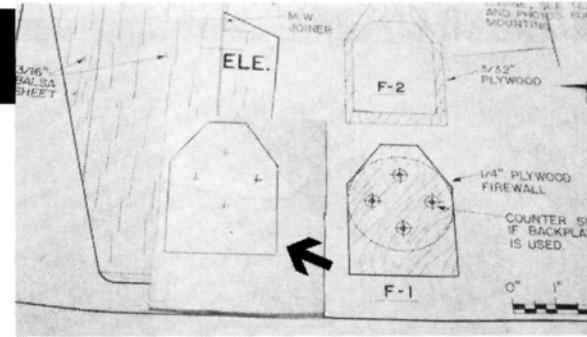
DOTTED LINE SHOWS POSITION OF PARTS

BALANCE POINT OR
CENTER OF GRAVITY





Use a straightedge to draw the parts.



The part drawn should be an exact copy.

WHY BUILD from scratch?

- It's cheaper (especially if you buy in bulk).
- You can select exactly the materials you want, rather than accepting those that come in a kit.
- You can personalize the design.
- It's psychologically more rewarding and earns you the respect of other modelers.

Do you feel apprehensive? To help you overcome your reservations, I offer these basic guidelines. For your first scratch-built effort, choose a model that's at the right level of difficulty (LD). In the Plans Directory, each plan has been assigned an LD; if you're a beginner, choose an LD 1 plan.

BACK TO THE BUILDING BOARD

A scratch-builder's most important "tool" is a flat building board, and the old standby has always been a door panel. I use a standard-size solid door without a doorknob hole in it. Solid doors are generally flat and won't warp as easily as the hollow kind. You can cover the surface with $\frac{1}{8}$ -inch cork (available in rolls from hardware stores), foam-board or Homosote®, which is fast becoming a favorite.

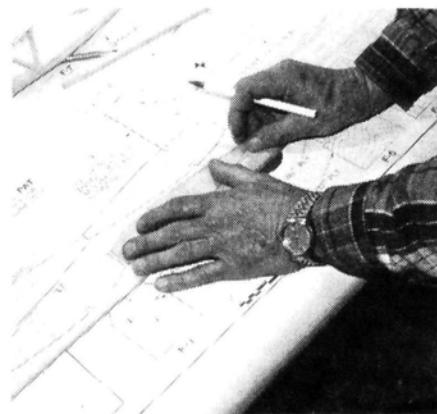
If you don't have a large table on which to set the door, make a frame out of pine 2x4s, supporting it in the center so it won't sag later. Buy an outlet box with an extension cord so that you'll have ready access to electricity. You'll also need some basic tools (see the checklist).

ABOUT PLANS

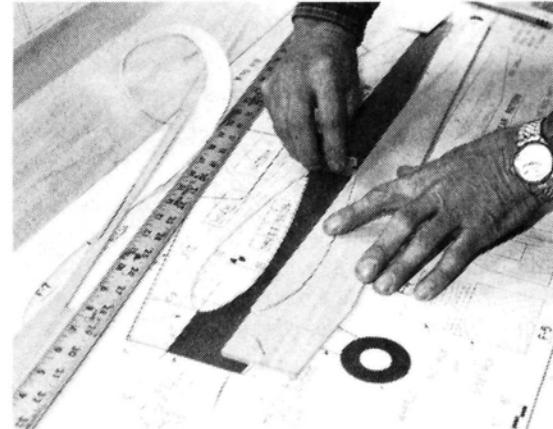
If possible, buy two sets of the plans you want to use: you'll cut one up for patterns, layouts, etc., and use the other for reference. Obviously, you can't refer to the wing drawing if it's pinned to the table with half a wing built on it. If you plan to make more than one airplane, make permanent patterns of the parts out of plywood, metal, or thick Mylar.

You can avoid having to cut the plans: put tracing (carbon) paper over the wood; put the plans over the paper; and then draw around the parts' outlines. I use a dried up ball-point pen that won't make a mess on the plans. I always cut my parts slightly oversize, because it's easier to trim a little wood off than to add it!

When drawing parts on wood, always pay attention to the direction of the grain shown



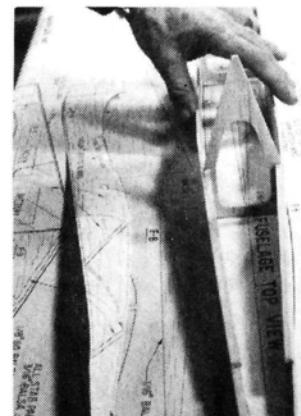
- Top: Align the fuselage sides over the plan's center line.
- Far Left: With a master rib pattern, draw ribs on the balsa sheet.
- Left: Final-sand the ribs until they're all exactly the same shape.



Check the part against the plans after cutting it to size.



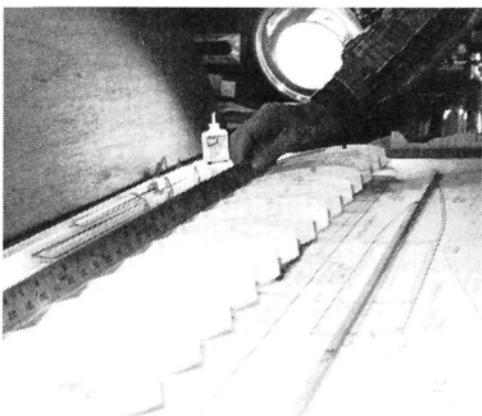
Use a triangle during assembly.



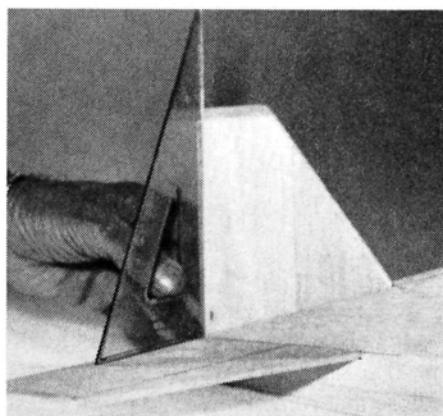
SCRATCH BUILDING



Use wax (or wax paper) to prevent the parts from being glued to the plans.



With the ribs in place, check that they're uniform.



Use a triangle to align the stab.

on the plans. If none is specified, as a general rule, you should have the grain running in the direction of the longest dimension. For example, a wing rib would have the grain running along its length. The exceptions to the rule are fuselage bulkheads, which need cross-grain strength. Even with these, it's

usually best to reinforce the bulkhead by adding a cross-grain stiffener or doubler of some sort.

Give the designer credit for designing a structurally sound airplane. Bear in mind that if you "beef it up" here and there as you go along, you might alter the wing loading sufficiently to end up with a big disappointment.

Because of the way in which it's reproduced and the material used, *no plan is 100-percent accurate*. Blueprint paper expands and contracts with changes in humidity, and the image-transfer process also causes a slight distortion on the reproduced sheet. Check the size and symmetry of each part before you glue it into place. It's not unusual to have one wing half slightly shorter or longer than the other on a blueprint, so make sure you check them, as well as the aileron location and size. Check the symmetry of parts by referring to a center line.

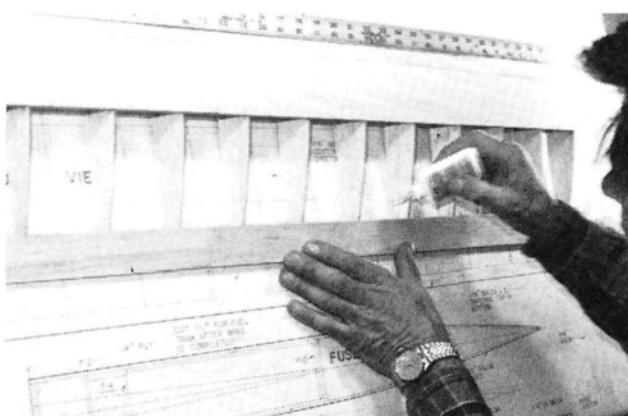
Most drawings used for the construction of model airplanes show the side and top views of the fuselage, the horizontal stabilizer top view and the wing top or bottom view. This enables you to build the wing and at least one side of the fuselage over the plans. Build one side, then the other. If there are stringers to add to the sides (such as the $\frac{1}{8}$ -inch-square strips), you can assemble one side and then use it as a guide for the other.

WHICH WOOD?

When you scratch-build, you can carefully choose your own wood, and this can make a big difference, not only to your plane's weight, but also to its strength.

How much wood will you need? Go over the plans and make a list of all the pieces shown. Total the lengths of the widest pieces, e.g., if you need more than one $\frac{1}{4}$ -inch-square balsa strip (for wing spars), total their lengths and divide by 36—the usual length of the balsa wood in the hobby shops. If your answer is 8.3 pieces, you'll obviously need 9 pieces.

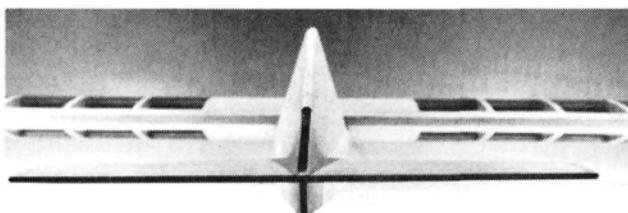
Do the same thing with the balsa sheets of the same thickness. To calculate the number of sheets you'll need for wing ribs, measure the length of the rib and multiply this number by how many ribs you need (if they're of equal lengths); divide by 36 (the length of your balsa sheet), and then divide that number by the number of ribs you can place side by side on a piece of 3- or 4-inch-wide balsa (usually one or two). For example, if you want 30, 2x8-inch ribs, $8 \times 30 = 240$; di-



Make sure the wing is correctly aligned (flat, if it's a flat-bottom wing) before you glue sheeting to it.



For straight edges and flat surfaces, use a sanding board.



The horizontal stab should be parallel to the wing.

(Continued on page 123)

ULTIMATE BIPE

(Continued from page 83)

Perry Aeromotive* fuel pump, which solved the problem. The Fox and the Ultimate flew as if they were meant for each other. Takeoffs were straight with a touch of rudder to correct torque. The tail came up quickly, and I had to use back pressure on the elevators until the wheels broke ground.

The ailerons are authoritative; the elevator is crisp; and the rudder really kicks the tail around. That's in low rate! When I switched to high rate and hit the snap switch, the Ultimate did three snap rolls before I could release the switch. Only one snap is accomplished by blipping the switch—you can't wait for the maneuver to start. You blip and know it's going to happen. Climbing knife-edge was a breeze, but I'm too chicken to hang on for a knife-edge loop. Inverted flight did need some forward stick, but that changed when I adjusted the CG.

During the test hops, a couple of National Guard helicopters landed at the armory next to our field. The crew walked over to watch the Ultimate perform, and one pilot asked for copies of the plans! This ol' boy designed himself an aircraft that he's not qualified to fly! Maybe you are. You can order yours from *Model Airplane News*.

*Here are the addresses of the companies mentioned in this article:

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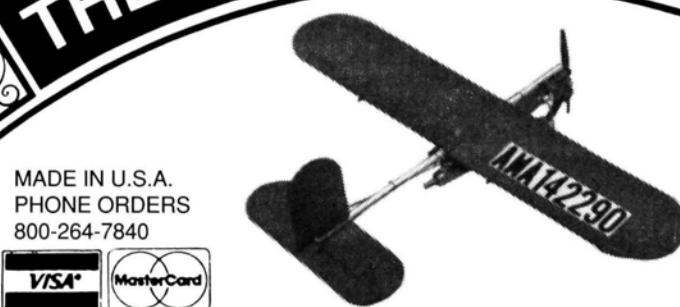
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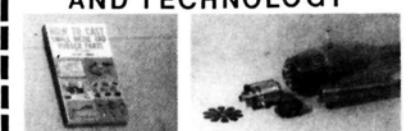


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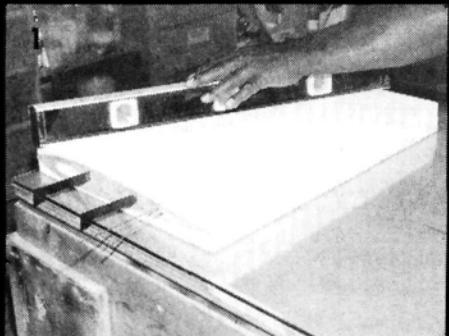
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■ 1. Make sure that the cores are straight, and sand the high spots. ■ 2. Have a flat, clean table and your supplies ready. Sand and then vacuum the foam-cores. Keep solvents away from them! ■ 3. Put a large piece of wax paper under the wing skin. Mix a small amount of Z-Poxy, and pour it onto the wing skin in small puddles.

SHEETING FOAM-CORE WING PANELS

by FRANK TIANO

A "Sporty Scale" Special Report

You might be surprised to learn that over 50 percent of the R/C modelers in the U.S. have never sheeted a foam-core wing with balsa wing skins. For many of us, sheeting (skinning) a foam-core is like going to the dentist! In the past few years, many of the people I've talked to have admitted that they'd like to enjoy the advantages of a foam wing, but they didn't have the nerve to tackle such a "high-tech" procedure. Well, I'm here to tell you that it *isn't* high tech, and it *is* easy! If you've ever wanted to trust someone about this procedure, trust me—it's a piece of cake!

In this article, I'll take you through the step-by-step process of sheeting a set of Aggressor II wings from a Bob Vi-

olett Models* kit. I suggest that you grab a cup, bottle, or glass of your favorite beverage, relax in a quiet spot by yourself, and read what follows—read it twice if you have to, but read every word, and look at every picture. I promise that, in less than an hour, you'll be an expert, too!

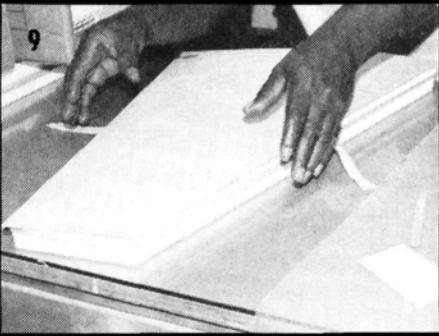
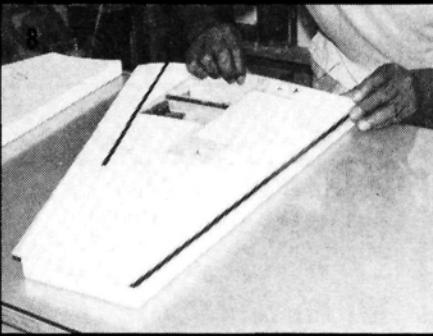
PROPER PREPARATIONS

Before you begin sheeting, make certain that the foam-cores are absolutely straight and free of dents. To keep them neat and clean, always work on the cores while they're still in the bottom half of their foam-sleeve packaging. In photo no. 1, you'll see my friend Charlie Chambers checking to see whether the Aggie's cores were straight and true. They were!

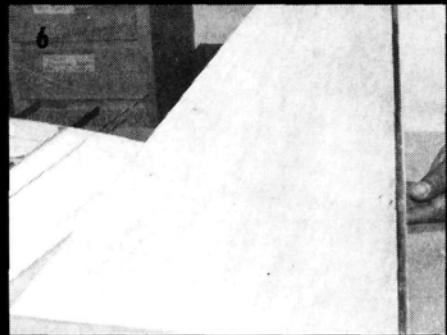
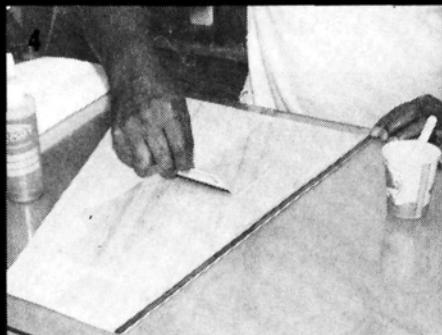
To cut or relieve any area of a wing

that requires it, fasten a sharp knife or a piece of music wire (bent into the shape of a box) to your soldering gun. It's quite a simple procedure, really. Just pull the trigger on the gun, wait for the wire to get hot, and slice through the foam—it can be cut as easily as warm butter! Use a long sanding block to smooth any ripples left from the hot wire used when making your set of wings. When you've completed the construction and sanding, you're ready to start sheeting.

To do a good job, you'll have to take care. Make sure that your work area is level, clean and uncluttered (you don't want an errant screwdriver to make nasty impressions in the delicate foam), and don't forget to scrape away all those hardened CA globules that are left over from previous projects! You don't want anything to mar the fragile foam-cores.



■ 7. Use the bottom foam sleeve as a cradle, and place the wing skin onto it (glue side up), followed by the core. Press down evenly. ■ 8. Apply a little epoxy to the wood-frame areas surrounding the retract and bellcrank bays. Notice that Charlie is working in the foam cradle (or sleeves). ■ 9. After you've applied the glue, press the top skin into place, and smooth the surface with your hands to ensure contact with every square inch.



■ 4. To cover the entire skin, squeegee the epoxy spanwise with an old credit card or playing card. Work slowly and carefully—too much epoxy only adds weight! ■ 5. A layer of epoxy covers the entire skin. ■ 6. The wing skin is ready to be placed onto the foam-core. Put epoxy around the areas of the core that need reinforcement.

(Don't worry; in less than 15 minutes, they'll go from being as fragile as a piece of your favorite crystal to as strong as a builder's 2x6!)

SUPPLIES & SUCH...

OK, now you can gather the necessary supplies. You'll need mixing cups (small paper cups are fine); a squeegee (an old credit card, or a regular playing card will do the job); mixing sticks; rubbing alcohol and paper towels (to clean up); and some of your favorite epoxy. Use an equal-mix type that has a pot life of 20 to 30 minutes and a curing time of 4 hours, or so. We use Z-Poxy* Finishing Resin, but if you have another long-curing epoxy, go ahead and use it. *Please*, stay away from anything that doesn't offer an equal-mix formula, and *never* substitute a 30-minute epoxy. (Thirty-minute epoxies are designed for construction; good ones will be too heavy for sheeting wings and quite rubbery after they've cured. They aren't meant to be sanded like finishing resins!) Something else to remember: don't be in a hurry, and *never* add extra hardener when you mix the epoxy. (Unlike polyester resin, epoxies become "gummy" when you add extra hardener—not harder, or more crisp!)

PAINLESS PROCESS!

Sand the assembled wing skins with a large, flat sanding block, and then vacuum the skins and the cores. Next, prepare about 1 ounce of epoxy in a cup, and pour it onto the wing skin in small puddles. (Check out photo no. 3.) Now, squeegee the epoxy all over the wing skin so that a smooth, even film covers every inch of the surface. Notice Charlie's method shown in photos no. 4 and 5. Photo no. 6 shows the skin with all the epoxy spread evenly. You can pick up any excess finishing resin with your squeegee, return it to the cup, and use it on the foam-core in areas that require beefing up. You'll notice that, in photo no. 6, Charlie has added excess Z-Poxy to the areas that had been cut from the foam-core and to the Violett Supply carbon-fiber reinforcement strip that runs spanwise along the foam panel.

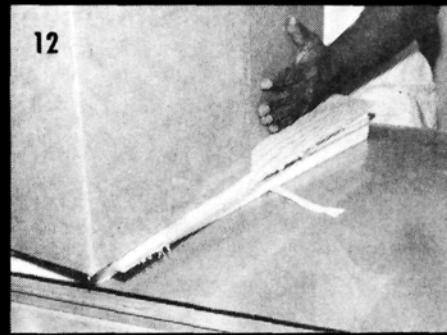
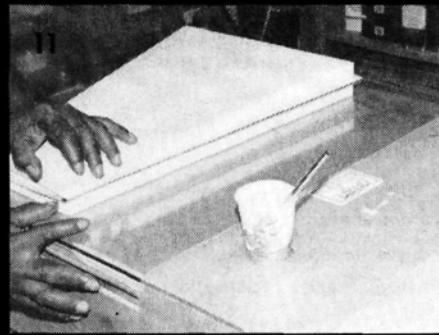
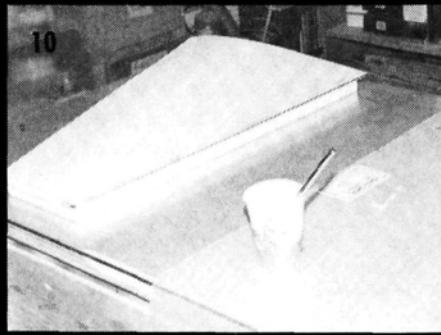
Once you've applied a smooth, even coat of epoxy to the skin, as well as extra epoxy to areas that should be strengthened, place the wing skin onto the foam-core. Lay the skin in its cradle (glue side up) and nestle the foam-core into it. Make sure that the skin is in the proper location, and then go on to the other wing skin. Charlie and I worked on the bottom skin first and then the top.

Once again, we mixed an ounce of Z-Poxy, squeegeed it over the skin, and put a little extra along the retract recesses and the carbon-fiber reinforcement strip. In photo no. 8, we're now working with the foam sleeves to maintain a straight structure.

Position the top wing skin and smooth the structure by repeatedly rubbing the surface with your hands. This ensures that the thin coat of epoxy contacts every inch of the foam-core! Photo no. 9 shows how it's done, and in no. 10, you see the finished product. Check out pics 11 and 12, and you'll see why these cores must be absolutely perfect.

Put a piece of scrap plywood, or some other material, onto the foam sleeves, which now encase the sheeted cores. Use as much weight as you can (e.g. boxes of books), and distribute it evenly over the surface of plywood. The weight will keep the wing skins in contact with the foam-cores while the epoxy cures. For optimum results, let the structures cure overnight. Repeat the procedure for the other wing panel, stack it on top of the first panel, and put weight on top of both. It doesn't make any difference whether you weight the wing panels one at a time or together.

(Continued on page 94)



■ 10. One wing panel is almost ready to be put away overnight. ■ 11. Put the sheeted core back into its corresponding sleeve. The trailing edges will stick out slightly, but that's OK. ■ 12. You must distribute the weight evenly. The foam sleeves compress the skins and keep them next to the cores while they cure.

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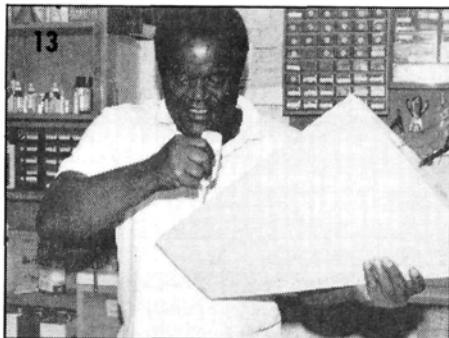
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FOAM-CORE WING PANELS



Charlie used some Zap-a-Gap to seal the trailing edges. Trim and sand the panels to prepare them for fiberglassing. (Covered in the next installment.)

but you must distribute the weight as evenly as possible!

The next morning, remove the weights, and slip the sheeted cores out of their sleeves. Run a bead of Zap-a-Gap* along the trailing edges of the balsa skins, and pinch them together as you go. The trailing edges must be glued this way, because they were outside the area of the sleeves that was under the weight. Before you add the leading edges and the wing tips, put the wing panels back into their respective sleeves, and sand or trim them. Finish-sand the wing panels with 320-grit paper, and put them aside for covering.

On a scale model, or very high-performance ducted-fan aircraft like the Aggressor, the wings should be finished with fiberglass cloth and resin for more integrity and durability.

ONE PART DONE — ONE TO GO!

That completes stage one: sheeting the foam-core wings. It was simple, wasn't it? Just think of how many designs you've avoided over the years, simply because you didn't think you could do this!

For those of you who are saying that sheeting wasn't so bad, but how, in the name of Stunning, do you apply fiberglass cloth? Who makes the cloth? Which glue do you use, and how much? How many coats, and when can you sand it? Do you have to use primer, or can you go right to paint? Relax! I'll cover all these questions in "How to Fiberglass a Balsa Structure." Stay tuned and, in the meantime, why not go out and check a few sixes!

*Here are the addresses of the manufacturers mentioned in this article:

Bob Violet Models, 1373 Citrus Rd., Winter Springs, FL 32708.

Z-Poxy Finishing Resin, Pacer Technology, 6420 Santa Anita Ave., Rancho Cucamonga, CA 91730.

Zap-a-Gap; distributed by Frank Tiano Enterprises, 2460 SW 85th Terrace, Davie, FL 33324.

GIANT STEPS

(Continued from page 56)

IN GENERAL

Taking care of your models before putting them away for the winter will pay off on that first spring trip to the flying field! You'll save time because your radios, engines and batteries will be ready to go; you'll know that your models are as good as they can be; and you'll be flying a *safe* airplane. The controls will work properly, the airframes will be in topnotch order, and your enjoyment will be increased if you don't have the hassle of getting things ready.

BOOK

The computer model design and testing book (CAMADAT) mentioned here previously is now available from ViP Publishers Inc.* for \$19.95, plus \$2 for postage and handling. For an additional \$9.95, there's an optional 5 $\frac{1}{4}$ -inch disc (*only when the book is ordered*) available. The disc contains all the programs in MS/PC-DOS format. If you send for ViP's catalogue, use a no. 10 envelope for your SASE—the catalogue is getting larger all the time!

*Here are the addresses of the companies mentioned in this article:

SR Batteries, Inc., Box 287, Bellport, NY, 11713.

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Len Bosman, 193 Baltic St., Coquitlam, B.C., Canada V3K 5G9.

IMAA FESTIVAL

(Continued from page 65)

ended his flight with a perfect, scale, wheel landing.

Then it was time to fly Ralph Braun's 16-foot B-17, which was powered by four Q-42s. I didn't get the pilot's name, but he did a fine job, and those Q-42s sure sounded great.

Although many pilots left on Saturday, there were still enough of us around on Sunday to keep several planes in the air until the 3 p.m. closing time.

SOME AFTERTHOUGHTS

Several modelers complained about the use of two flight lines and the poor vehicle access to the pits. The rain solved the first problem, and the shuttle system that was put into operation on Friday solved the second. The EAA also said that

(Continued on page 115)

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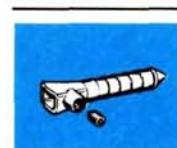
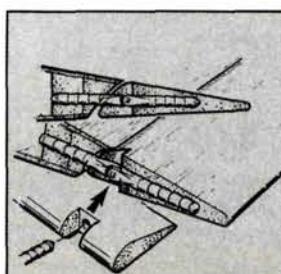
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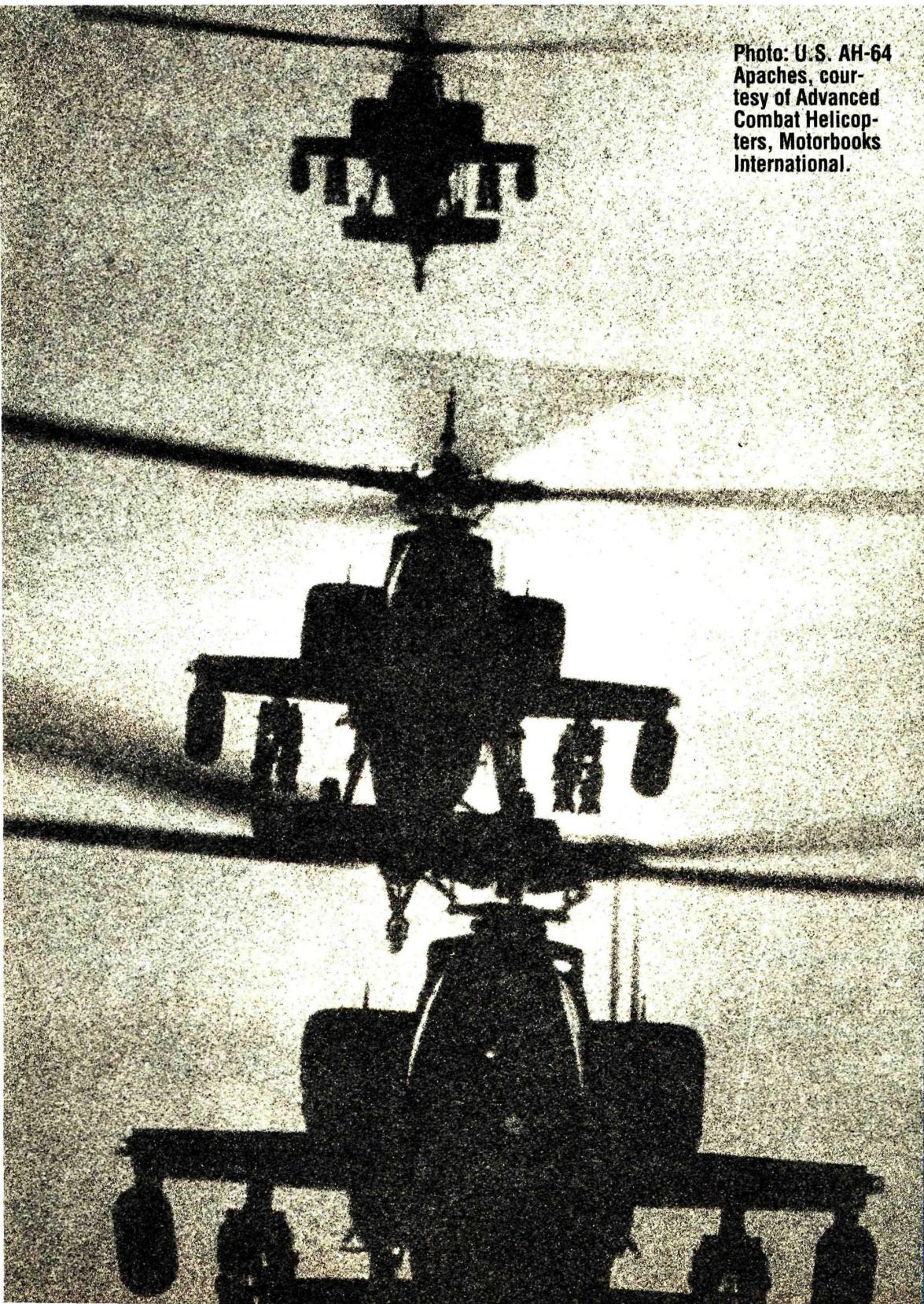


Photo: U.S. AH-64 Apaches, courtesy of Advanced Combat Helicopters, Motorbooks International.

- 101 The Kalt Whisper**
by Craig Hath

- 107 Helicopter Secondary Fuel Systems**
by A.E. Stanley

- 109 Helicopter Challenge**
by Craig Hath

- 112 Rotary-Wing Roundup**

The following pages contain Craig Hath's Pad & Bench Review of the all-new, electric Kalt Whisper—a machine we believe marks an advance for electric propulsion in the heli world. In "Helicopter Challenge," Craig offers basic tips to get you started with constant rudder speed for better throttle and collective-pitch control. Check out our "how to" on secondary fuel systems, in which A. E. Stanley shows you the easy way to gauge in-flight fuel levels, and read "Rotary-Wing Roundup" for information on the latest heli products!

KALT

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PHOTOS BY CRAIG HATH & BLAINE HATH

**Electric power
makes a major
advance in the
heli world**

by CRAIG HATH

ELECTRICS ARE quietly taking hold in the R/C hobby, but helis are one of the last of the hold-outs. In the recent past, electric-powered helicopters had little to offer except poor performance and high cost. I tried two, but despite my competent approach to building and flying them, I was unsuccessful at getting either to fly reliably; in fact, one of them wouldn't leave the ground at all!

The biggest defect of early electric helis was that they were too small (this contributed to their instability), and the rotor disc's angle of attack was fixed (fixed pitch; more on this later). Going way back: I remember an electric helicopter that was called (I think) the

"Playboy." It was a little larger, and presumably easier to fly, but the overall scene with R/C electric helis has been fairly bleak and frustrating. Enter the Kalt* Whisper!

My first exposure to the Whisper was at the summer '90 Kyosho Challenge in Champaign, IL. Kalt had sent Yoshiaki Nagatsuka over from Japan to demonstrate a Whisper prototype, and he was able to do "magic" with it: loops and rolls—even autorotation. The Whisper was a crowd stopper! From then on, I knew electrics had really come of age, and being able to do an in-depth review of the Whisper has helped heal the wounds from my past electric helicopter adventures.

THE KIT

The Whisper is a "serious" model helicopter, and it's very much like the larger Kalt helis. It's designed around a collective-pitch rotor system, and this makes a major contribution to its good performance. Having "collective pitch" means



The parts for the major assembly steps are bagged together.

that as the throttle is opened, the rotor blades' angle of attack increases to develop lift. A heli with collective pitch is much easier to fly because control inputs for making it rise and fall produce immediate results.

Fixed-pitch rotor blades are locked in one position, or angle of attack, and the lift is varied by changing the rotor-head speed. This system can really be tough to handle, because there's often a lag between the moment when the throttle is opened to create more lift and when lift is actually available. Imagine stepping on the brakes of your car and having to wait for them to grab! Collective pitch enhances the Whisper's performance.

machine. In designing the Whisper, Kalt started from scratch. (I didn't see any parts that had been taken from other heli kits.) Their main concerns were simplicity and saving weight.

- The primary mechanics are assembled together around a single frame or crutch.
- The tail rotor is driven by a toothed drive belt so that no transmission is needed to turn the tail-rotor blades.
- Most of the components are made of a light carbon-fiber-reinforced plastic.
- To save weight, the main-rotor shaft and stabilizer bar are both made of hollow stainless steel.
- The motor is a Mabuchi 540 VS

The Whisper is available as a basic kit that requires

The Whisper's size is important, too, because a larger heli has more chance to fight wind gusts and strong breezes. If you were to compare the Whisper's size with those of gas-powered model helis, it would be roughly the equivalent in power to a .10- to .15-size

you to assemble all the major components, or as a partially assembled version that needs only minor assembly and installation. Kalt's U.S. distributor, Hobby Dynamics, also offers a Whisper accessory pack that includes: three JR305M microservos and one JR3035 servo (for collective pitch); the new Kalt electronic helicopter speed controller; the Kalt mini-gyro; and an 1100mAh, 9.6V, Ni-Cd battery pack.

You'll also need a 5-channel (or more) helicopter radio system and a charger that's capable of quick-charging the 9.6V battery. Two metric hex wrenches are included with the kit,

step assembly manual, its construction was very straightforward. I won't go into details because the manual handles construction so well, but I will, however, share some observations and clear up some of the difficulties I had. (The manual I had wasn't the final draft.)

Assemble the rotor head first. The drawings show shouldered ball bearings for the see-saw hub. You must insert the shoulder bushings into the ball bearings from the inside of the hub and fully seat the bearings. Be sure that the two ball bearings in each blade grip are fully seated before you attempt to screw the grips into the hub plate.



The JR Max Computer 6 radio system handles control.

and you won't need any other special tools.

CONSTRUCTION

My kit was the basic version and, aided by the step-by-

During assembly, you'll find that some of the fasteners for each step are packed in the parts bag with which you're working; if you're missing a screw or a bolt,



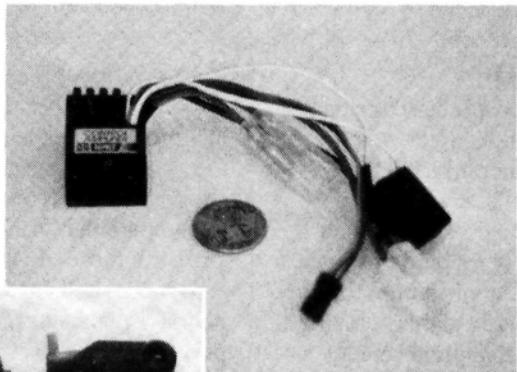
Whisper

you'll find it in one of the bags of fasteners. The kit included every screw I needed; I just had to dig to find them.

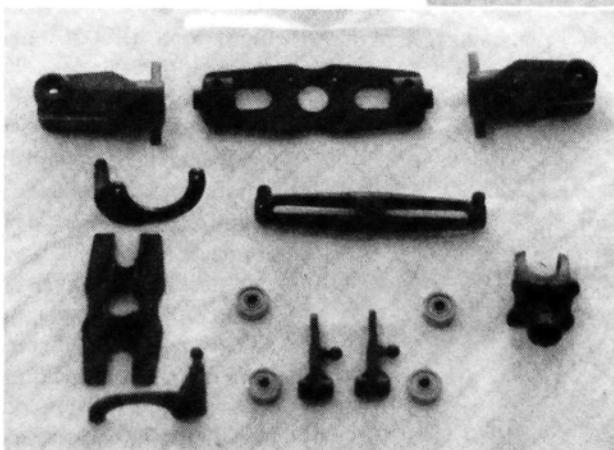
To be sure that the parts fit, trial-fit the pitch-control rods in the pitch-control ring before installing it into the mainframe. I had to remove a little plastic flashing from the pitch-control ring before I could get one of the rods to fit into it. Be sure to use Loctite* thread-locking compound (or an equivalent) on the tail-rotor hub setscrews and tail-rotor blade grip screws. *Don't* get any of it into the tail-rotor blade grip bearings.

In the manual, you'll note that a new shock-ab-

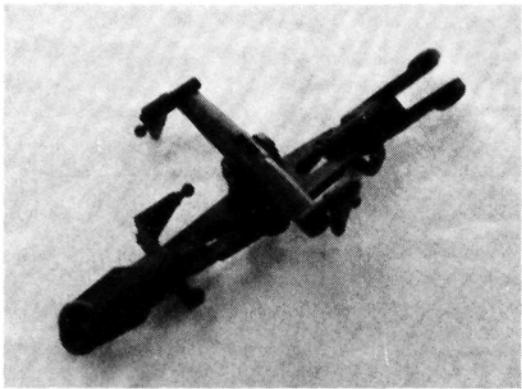
through the tail boom; I also hooked the clevis over the toothed belt and pulled the belt back through the tail boom. You can tension the drive belt properly by pull-



This photo shows the sizes of the Kalt speed controller and gyro—very compact!

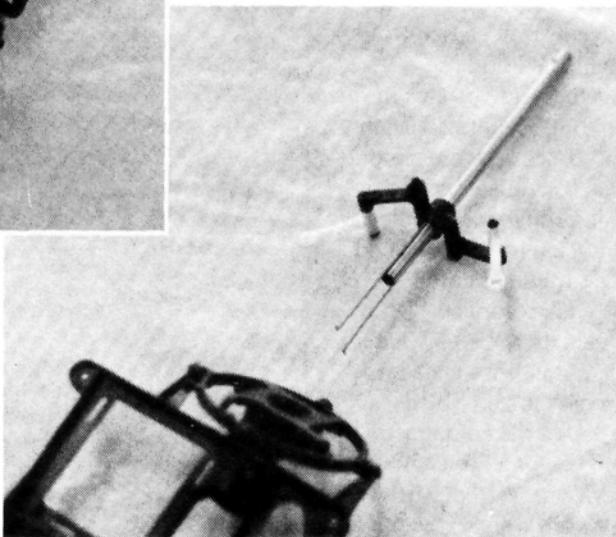


The rotor head is being prepared for assembly; all the parts were bagged together and fit well.



The finished rotor head ready to install.

The mixer arms and pitch-control rods are shown being installed on the main shaft and trial-fitted into the mainframes.



sorbing landing-gear system is used. (Be sure to look at the drawing.) Cut a small piece of silicone tubing into four equal lengths, and slide one over each of the four steel bushings. I had trouble getting the stabilizer bar clamped down tightly enough with the plastic retainers. A 2mm Allen-head screw could be traded for this part to make tightening easier. I put a clevis on the end of the tail-rotor pitch-control linkage and fished it

back on the tail boom just until the slop between the belt and the gear has been removed.

The manual didn't men-

tion a motor break-in procedure, and there are several ways to approach this. I dipped the motor into a glass of cold water and ran

an entire charged battery pack down. Alternatively, you could run the motor at full speed for five minutes, allow it to cool for five minutes, and repeat this cycle for about an hour or so. You may have your own method of motor break-in; whatever it is, you should follow it before installing the motor.

Before you tape the gyro amplifier box under the front of the mainframe with double-sided tape, look at the box itself. On one side of it, there's a door that's taped shut. Mount the box so that the door faces downward and can be reached without taking the box off the mainframe. The amplifier box contains the gyro reversing switch and sensitivity adjustments; you'll need access to these later.

Hooking-up the radio gear and connecting the servos to their control linkages is fairly uncomplicated. *Make certain that the servos are centered before you install the output arm, and check the trim levers on the transmitter.* Being off-center here can cause the helicopter to respond unevenly to control commands. A special note about the position

of the collective-pitch arm: the centered position of the servo output wheel as shown in the manual, intends that the transmitter collective/throttle stick is in its mid-throw or centered position. This is the point at which the helicopter should hover.

BUILDING THE ROTOR BLADES

You'll find four aluminum washers in the bag that contains the white heat-shrink tubing. Use these washers in place of the plastic ones shown in the manual. Glue the washers into place with CA or 5-minute epoxy.

Even though the blades are supposed to be balanced at the factory, you should check them to be sure. I have a scale that weighs to within $\frac{1}{10}$ gram. The blades in my kit differed by 1.2 grams, which is a very large discrepancy for a small set of rotor blades. If you don't have a scale, use a model airplane prop balancer like the one by Prather Products*. Balance the blades *after* they've been covered; add tracking tape (included on the decal sheet) to the tip of the light blade until the two blades sit level in your hand.

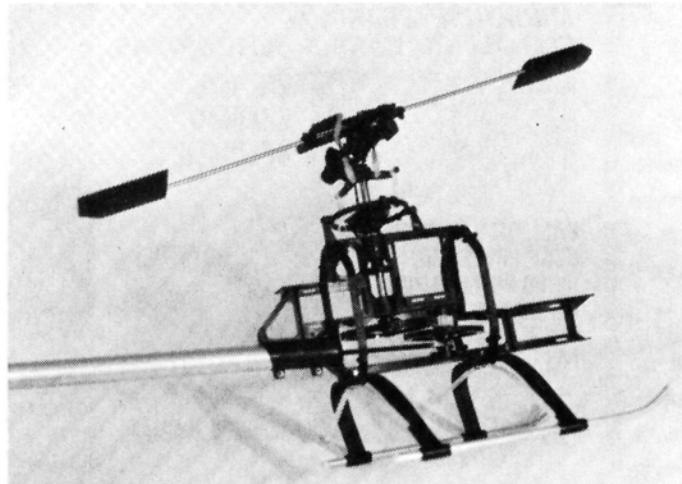
The steam coming out of the spout of a tea kettle filled with boiling water is at the perfect temperature to shrink the heat-shrink covering without melting it. When you've shrunk the blade material tightly over the blades, trim off its ends and seal the covering to the blade tips with CA.

The manual mentions that reinforcement plates are

to be glued inside the body. In the kit, the plates start as a white plastic piece that must be cut into the four reinforcing parts. Glue the plates over the dimples where the body-attachment screws go, and *don't skip this step*. Go over the machine thoroughly, checking for loose screws, nuts or bolts, and re-check all moving parts for any binding or excessive slop. Use some small cable ties to keep the radio wires out of the gear mesh and away from hot areas.

FLIGHT PREPARATION

Go over the preflight checklist in the manual carefully. Make sure that the speed controller is adjusted so that the motor will stop when the throttle stick is in the full-



The tail boom and rotor head have been added to the basic mechanics.

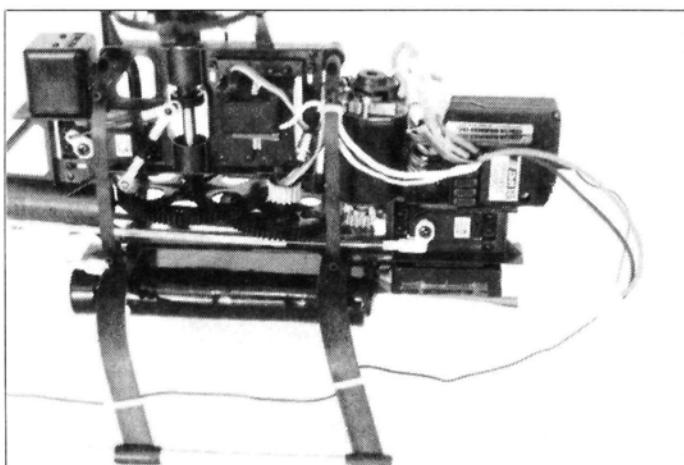
version of the manual that came with my review kit, the tail rotor will be uncontrollable because the rotor blades' low speed won't allow the tail rotor to turn fast enough to counter the torque of the main rotors. You may have to vary this somewhat for a stronger motor; for aerobatics, you'll

ing. Have patience here: for the best performance, the blades must track *perfectly* in a hover. To prevent the rotor head from being damaged during storage, mark and remove the rotor blades after each flying session. When you put the rotor blades back on the head, make sure each is in its *original* blade grip, and re-track them before every flight.

WE'RE FLYING!

Now we can have some fun! When I flew it, the Whisper turned out to be quite a surprise! At first, I had some difficulties because the recommended pitch curve was a touch too high. When I had worked this out, the machine came into its own. Owing to the low speed of the tail-rotor blades, I had trouble controlling the tail rotor; but when I increased the main-rotor hover speed by reducing its pitch, I regained control of the tail.

I chose the JR* Max Computer 6-channel radio, and its many features are adequate for the job. Having the computer control total servo throw, direction and neutral point allows for a



This is the right side of the completed radio installation.

low position.

I found that my Whisper flew best using this pitch curve: hover or neutral, +4 degrees; top end, +6 degrees; low end -1 degree. If you attempt to hover the Whisper using 9 degrees of pitch as shown in the draft

need a little more negative pitch on the low end.

ROTOR TRACKING

The rotor blades are difficult to track because, when the linkages are only adjusted half a turn, it makes a great difference to the blade track-

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Whisper

fine-tuning process that never leaves the transmitter. I continue to refine these adjustments, and the helicopter just seems to get better with each flight.

I was surprised at how stable the Whisper felt in a hover. It's very solid around neutral, yet responsive to the controls. I took many of the flight photos in gusty winds, which the helicopter handled well. Flight times have exceeded 5 minutes, and longer flights should be possible with batteries of a higher capacity.

Is the Whisper suitable for beginners? I think it has possibilities, as long as they install a good set of light training gear under it to help prevent tip-overs. Its biggest weakness as a trainer is its fragility, which is a by-product of Kalt's desire to reduce its weight. The Whisper might not stand up to the abuses of flight training too well.

FINAL NOTES

Be sure to read the section in the manual on battery care. Your battery pack should be completely discharged and cooled after each use. I opted for the Astro Flight* model 115 AC/DC Variable-Rate Charger, which allows both quick- and trickle charging, as well as discharging or cycling. This unit can use a 110V household current or a 12V auto battery as a power source. The model 115 meets all the needs of Ni-Cd battery care, and it worked perfectly during my tests.

Kalt plans to offer its own fast-charger for the Whisper as well as an autorotation clutch and a high-performance motor. These items will make the Whisper even more fun!

*Here are the addresses of the companies mentioned in this article:

Kalt; distributed by Hobby Dynamics, 4105 Fieldstone, Champaign, IL 61821.

Loctite Corp., 4450 Cranwood Ct., Cleveland, OH 44128.

JR; distributed by Hobby Dynamics.
Astro Flight Inc., 13311 Beach Ave., Marina Del Rey, CA 90292.

HELICOPTER SECONDARY FUEL SYSTEMS

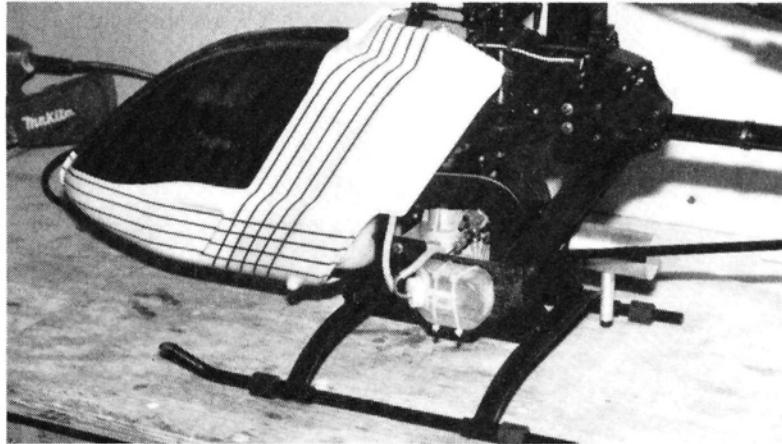
by A.E. STANLEY

Fueler tank for visibility and longer flights

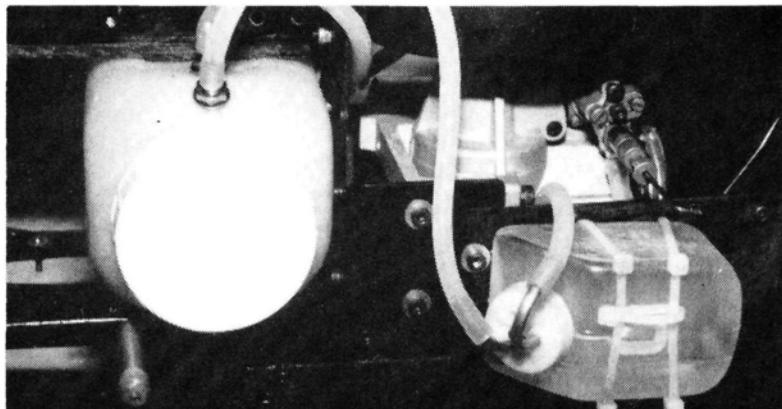
If you're like most helicopter pilots, you fly a pod-and-boom machine. Except for a certain German helicopter, the available models have fuel tanks inside their canopies, and this makes the fuel level hard to see. To see it, you have to hover the helicopter in front of you and turn it to the side slightly. How do you solve this problem? You add a small, secondary, "fueler" tank to the side of the machine, where it can be seen easily, even from a distance. I mounted a Sullivan*, 2-ounce, slant-type tank sideways, using a piece of sheet fiberglass (slightly larger than the tank) as a mounting plate/heat shield between the tank and the motor.

PERFECT PLUMBING

The plumbing for this tank is simple. A pressure line runs from the muffler to the vent side of the main tank, and another runs from the main tank's feed side to the vent side of the fueler tank. Use the brass tube that comes with the tank as the "in-feed" tube, and put it on the in-feed side of the fueler. It should run to the center of the fueler tank and close to its top. The fueler's "out-feed" line is also a brass tube that should pick up fuel from the center of the tank. With the pick-up in this location, your machine won't be fuel starved in any position. The tank will stay full as long as there's fuel in the main tank.



A 2-ounce "fueler" tank on the side of a heli can be seen easily, even from a distance.



One pressure line runs from the muffler to the vent side of the main tank, and another runs from the feed side of the main tank to the vent side of the fueler tank.

BENEFITS ABOUND

There's another benefit of using a fueler tank: when it runs at a constant full, there's very little air in it. Having air in a fuel tank leads to "foaming," and this causes lean-outs that lead to serious problems. By using a fueler tank, you can avoid these.

You'll also increase running times and, instead of landing with an ounce of fuel left in

your main tank, you can fly until you've used all the fuel in your main tank and almost half of what's in the fueler.

So, if being unable to see your fuel level is a problem, try a fueler tank, and happy flying!

*Here's the address of the company mentioned in this article:
Sullivan Products, 1 N. Haven St., Baltimore, MD 21224. ■

Helicopter Challenge

by CRAIG HATH

Constant rudder speed for better throttle and collective-pitch control

FOR MOST OF THE country, the flying season is over. If you put your equipment away in the best condition possible (charge the batteries, lubricate all the moving metal parts, make repairs, etc.), your machine won't need much preparation next season! (See "Giant Steps" by Dick Phillips in this issue.)

This month, I examine how to set up a helicopter with constant rotor speed (CRS). I've preached the use of CRS for several years but, from time to time, it's necessary to review it so the newcomers can catch up with the old-timers.

BENEFITS OF CRS

CRS matches an engine's power output to the load that's placed on the rotor disc, so the response to



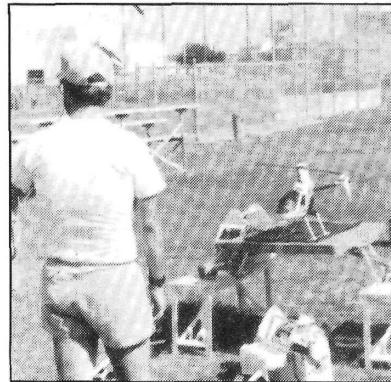
Nelson Segal (with his back to the camera) recently started in the hobby, and he has already mastered many "expert" flying skills owing to his Concept .30 (shown).

throttle/collective-pitch-control input is crisp and predictable. The rotor head turns at the same speed for any throttle setting, and this eliminates any lag time that would occur while waiting for the rotor head to increase speed to produce enough lift for a desired flight attitude. In simple terms, this means that power is available immediately.

Imagine what happens if collective-pitch changes are made when the rotor-disc speed is allowed to vary with the load that's placed on it. For example, picture a helicopter that's hovering in a fixed position; you want it to climb into a fast forward flight. As throttle/collective pitch is added, the rotor disc instantly increases pitch and takes a bigger "bite" of air. This places a greater load on the disc and increases rotor-disc drag. To produce more lift, the rotor disc must turn at the same speed, or faster.

When a helicopter hovers at a power setting that's below the optimum power curve, the rotor-head speed can actually decrease momentarily under the added load, even though the throttle is being opened as pitch is added. In this situation, power lags behind demand, and you must wait for it to catch up before you achieve results. In the example of the helicopter that's going from a hover to fast forward flight, when you add throttle/collective, it stumbles around until it "catches its breath" and takes off—not quite what you want, is it?

Now imagine that the helicopter



Newcomer Blaine Hath uses the Whiteman Ind. flight simulator, which lets a novice practice in his own front yard! It creates a virtually crash-proof environment and still provides the "feel" of hovering and motion.

is in fast forward flight, and you decide to land it. As you reduce the throttle/collective, the rotor speed slows, and the helicopter starts to descend. As the helicopter gets close to the ground, you need to re-apply throttle/collective to slow its descent and bring it in for a smooth landing. Because the rotor has slowed, when you re-apply power, you have to wait, once again, for its speed to increase enough to generate lift. If you wait too long to apply power, you could hit the ground—hard! Timing is very important with this setup. If you could set up your helicopter to produce an instant response when you change the throttle/collective control, flying would be much easier!

When you use CRS, you not only get optimum throttle response, but engine torque also becomes more manageable because you operate the engine in a narrower rpm range and power band. Managing engine

HELICOPTER CHALLENGE

Figure 1.

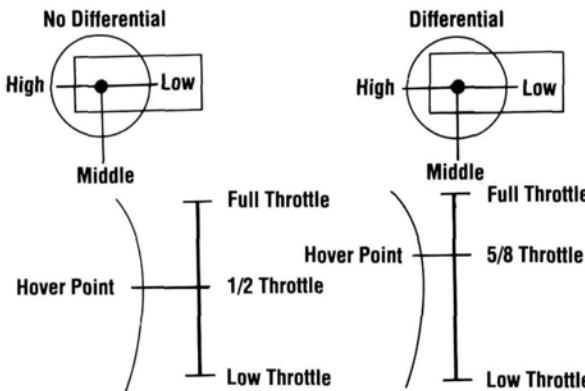


Figure 1. This drawing explains how to alter the throttle curve mechanically using servo differential throw.

torque better makes the tail rotor easier to control. Consider the example of the helicopter that's descending from forward flight. As the power is re-applied, additional torque twists the heli, and you have to apply more tail-rotor pitch to counter it. Because these "torque swings" can be severe, the tail-rotor situation often becomes hairy! I've seen many new fliers become spooked during this type of exit from forward flight—owing to the sudden shock of torque racing through the helicopter, the tail turns, and the nose points directly at them!

When your flight skills have progressed to aerobatics, a machine that's finely tuned with a good CRS setup will be better at performing stunts. CRS will make you look like a pro faster than any other setup technique!

HOW TO ACHIEVE CRS

To successfully obtain CRS, you must understand your particular radio system. Many of the new computer-based helicopter radio systems allow you to adjust both the throttle and pitch curves quickly for one or more flight modes. Making these adjustments electronically at the transmitter enables you to reach a nearly perfect CRS. If your radio system isn't that advanced, you'll have to compro-

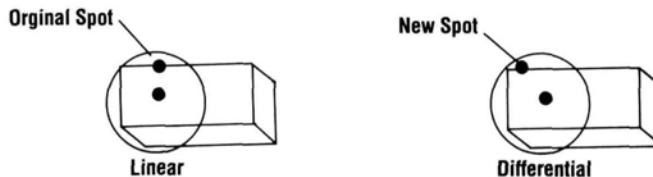
mise.

To begin the basic mechanical setup, make sure that the carburetor's throttle barrel is open to approximately $\frac{5}{8}$ of its full travel

servo travel that you want to shorten, you'll modify the servo throw so that more physical travel occurs for part of the servo rotation. As you introduce more servo differential, you'll have to place the linkage rod farther out on the servo wheel to retain the same amount of servo throw. (See Figure 2.)

With the modified throttle curve, the helicopter might hover with a higher rotor speed. To counter this, increase the hover pitch, and you should notice an improved throttle response. Just before liftoff, advance the throttle trim to "full high," and then hover the helicopter. Pay attention to the rotor speed as you raise and then lower the helicopter (from about 2 feet off the ground to 8 feet, or so, and back to 2 feet). The rotor speed should stay fairly constant. If it goes too fast during the descent, reduce the idle

Figure 2.



Original spot is close to the servo output. New spot must be moved further away to retain an equal amount of throw as differential is increased.

Figure 2. Moving the linkage hook-up point for the throttle-control rod as shown will give the results explained in Figure 1.

when the collective pitch is set in the hover position. This helps to ensure that the engine operates at the upper end of its power band when the helicopter hovers. You might have to make adjustments to open the throttle wide at full throttle and still have the engine idle slowly enough to "kill" on the low end. You can use the throttle-channel end-point adjustments on your transmitter (if it's so equipped), or use servo differential throw. (See Figure 1.)

If you move the output location of the throttle-control rod on the servo wheel closer to the half of

trim a little until it slows. If the rotor speed still varies dramatically, increase the amount of throttle opening at hover slightly, and repeat the process. Keep fiddling with it until you see an improvement.

Now you've achieved a very basic CRS; refining it will require more effort. Next month, I'll cover some of the in-depth elements of achieving CRS using the popular helicopter radio systems on the market.

ROTARY-WING ROUNDUP



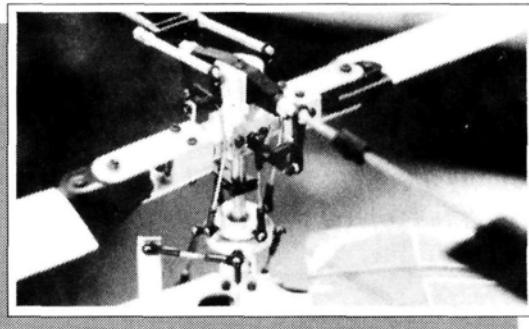
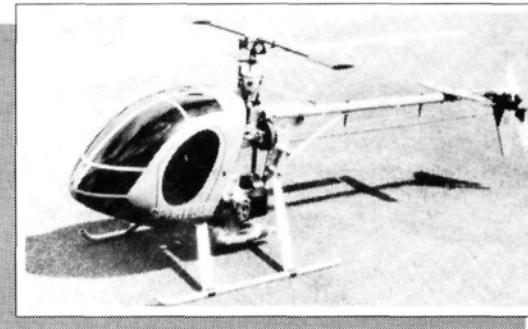
KYOSHO EP CONCEPT

Kyosho announces its new electric-powered helicopter—the EP Concept. Its features include: a strong, light main chassis; a Bell-Hiller mixing system; metal pivot balls on a swashplate; and autorotation capabilities. The EP Concept is an excellent choice for experienced fliers who want high performance with the ease and quietness of electric power. Specifications—length: 32.7 inches; weight: 42 ounces; main-rotor diameter: 35.1 inches.

Part no: KYOE0230

Price: \$399.95

For more information, contact Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61824.



HOBBY LOBBY INTERNATIONAL SPORT 500 COLLECTIVE PITCH

Collective pitch increases or decreases the angle of both rotor blades simultaneously, so it gives the Sport 500 helicopter more prompt control response and makes it more enjoyable to fly. Because it responds more quickly to "up" and "down" commands, you can even fly in gusty winds. Collective pitch lets you perform aerobatics, too!

The durable collective-pitch head on the Sport 500 is constructed in the same simple, solid way as the rest of the heli. It has all-metal parts that can endure mishaps, and unlike a head made of plastic parts, it can be lubricated and maintained.

Why not spend the extra \$86 for the Sport 500

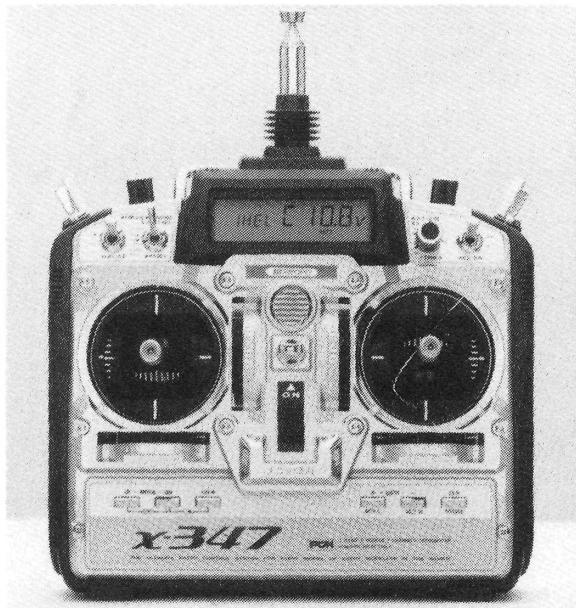
with collective pitch *now*, so that you won't have to pay \$120 to buy it as an add-on. Whether the Sport 500 has collective pitch makes little difference to beginners, but this heli flies so well—and you'll learn so quickly!—that you'll soon want the snappier response of the collective-pitch version.

Part nos. HLA401 (Sport 500 Heli with collective pitch); HLA402 (easy-to-install conversion kit).

Price: \$285; \$120.

For more information, contact Hobby Lobby International, Inc., 5614 Franklin Pike Circle, Brentwood, TN 37027.

JR DESIGN X-347 RADIO SYSTEM



Designed for competitive flying, JR's 7-channel PCM/PPM selectable computer radio—the X-347—is fully functional for helicopters, airplanes and gliders. With the touch of a few keys, unique data can be input and memorized for up to four modes. You can even *name* your models! Everything appears on the new, large LCD display, and each knob and switch is color-coded, so you can see at a glance which functions it controls. All this is wrapped in a comfortable, new, ergonomic casing.

Program the X-347 to fit your flying style—or styles! It offers four pitch curves, three throttle curves, two revolution mixes and one programmable mix. There are also switches for throttle hold and inverted flight and three separate stunt-flight modes.

With the first programmable-function trainer, the X-347 makes learning a breeze. This revolutionary system allows a trainee to control one function at a time; once proficient with that function, new ones can be added until he has gained

full control of the model. This means safer, easier learning. The X-347 is the radio of the future—today!

Part no J7XPH

Price: \$699.99

For more information, contact Hobby Dynamics, P.O. Box 3726, Champaign, IL 61826.

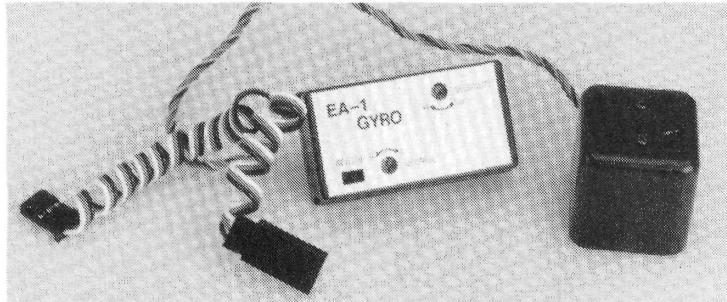
HOBBY DYNAMICS KALT GYRO

The new Kalt Gyro was specifically designed for electric helicopters like the new Kalt Whisper. This lightweight, dynamic gyro features sensitivity adjustment, which allows for maximum stability in hover and forward flight.

Part no. K40003

Price: \$114.99

For more information, contact Hobby Dynamics, P.O. Box 3726, Champaign, IL 61826.



ATTENTION, MANUFACTURERS!

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Tom Atwood, Editor-in-Chief, Model Airplane News, 251 Danbury Rd.,

Wilton, CT 06897.

IMAA FESTIVAL

(Continued from page 97)

if the IMAA returned to Oshkosh, flying time would be extended from 5 to 7 p.m., and this pleased a lot of people. Jim Van Loo reported that the cooperative EAA officials were very impressed with our planes, our flying and our conduct.

Even though it's a 1,500-mile drive for me, I'd return to Oshkosh for a future Festival without hesitation. Leaving Oshkosh, I drove due west on Highway 21. As I approached the Mississippi River in Western Wisconsin, I saw some of the prettiest countryside that I've ever seen—a fitting end to a great weekend. ■

SPORTY SCALE

(Continued from page 78)

again, but this year, they'll campaign with a brand-new C-45 Twin Beech. If watching a 100-inch Beechcraft isn't exciting enough for you, how about the new team of Frankel and Crooks? Yep, Mark Frankel's newest big Lear Jet is piloted by the very capable Dennis Crooks.

If you're curious about the competition in the Expert division, Bob Fiorenze will return with an all-new F-18, and Bob Violett will bring his new F-16. Other "jet jocks" include Bill Harris, Ron Gilman, Terry Nitsch, Mike Kulczyk and Jerry Ortego. I'm told that Charlie Chambers is trying to get his new F-4 ready, too. As far as the prop jobs go, look for many new planes that have never been modeled before. I'll be flying the new Don Smith Henschel 129 in Team Scale!

If you attend this Top Gun and don't like it, you might as well skip the rest, because you can't ask for better flying sites (in alternate years) than the Palm

Beach Polo Club on the East Coast and Mesa's Spook Field out West! The dates are May 2 through 5, with two days of static, two days of flying and four nights of serious partying! For more details, watch for ads right here in *Model Airplane News*.

Well, that's about it for this month, scale fans. Next time, we'll take a more in-depth look at new Top Gun entrants. I'll also show you a few things that make modeling a little easier and preview some scale accessories that have been around for a long time, but that you might have forgotten. I leave you with more rules to incorporate into your ledger for successful scale modeling:

- Turning your model's wheel pants upside-down won't qualify you for floatplane status.
- You don't have to wait till January to unpack that new '91-legal radio!
- Regardless of what the man says, ragged, crooked and uneven seams on a fiberglass fuselage aren't there to test your skills with a spatula and a quart of Bondo!
- Beware of anyone with only a post office address who requires you to mail money for a new product and then wait eight weeks for delivery.
- Now that Chris Chianelli is back at Air Age, it's very important to check your six!

*Here are the addresses of the companies mentioned in this article:

Pica Enterprises Inc., 2657 NE 188th St., Miami, FL 33180.

Model Engineering, 3705 Marlin Court, Raleigh, NC 27604.

Top Gun Information, c/o Frank Tiano, 2460 SW 85th Terrace, Davie, FL 33324. ■

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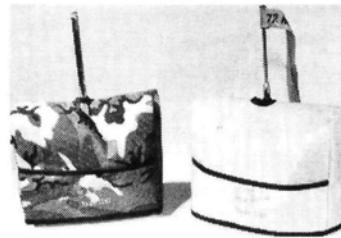
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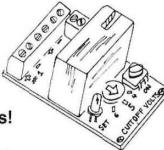
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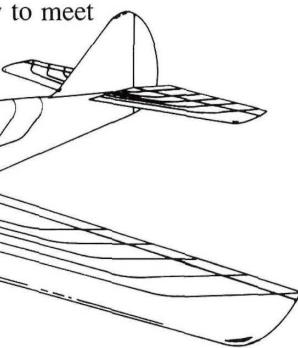
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GOLDEN AGE

(Continued from page 39)

Rudder-Only winner was Fred Romano, who was a "name" in the Jersey area for years. Flying his favorite event—Intermediate—Howard McEntee easily outscored all others. Multi was won by Vince Bonnema, who was a particularly active R/Cer, and his son is now a well-known pattern designer. I also recognize the name of Ernie Reuther, who did so much as a leader in that Jersey club.

The 9th Annual Great Lakes Invitational Meet at Detroit is also mentioned. One day, I'll devote a column to those tremendous early contests; I just need info and photos! Remember, these were "Top Gun" meets with 25 of the country's finest invited to compete for excellent prizes. The 9th was won by the newly crowned World Champ, Kazmirski, who barely edged out Bob Dunham. I placed 4th, using Space Control (in a major competition for the first time) and a prototype Viscount airplane. Don't forget that the Detroit Invitations were commercial endeavors; there was an admission fee, and the club had good results.

Dee Bee Engineering offered a propo servo (pulse style), which, using a Mighty Midget motor with special spring centering, sold for \$14.95. Don Brown used it in his victorious Nats plane and later progressed to his fine Quadraplex systems. Lord Mounts for damping engine vibration are mentioned. Is there anything really new under the sun?!

Four pages are devoted to John Phelps' development of pulse and feedback servos. John gives a detailed, step-by-step description of how the circuitry operates, and he also includes the necessary schematics, a parts list and even sketches of the servo mechanics. Such help was always appreciated.

DON'T FORGET THE SPAR WEBBING

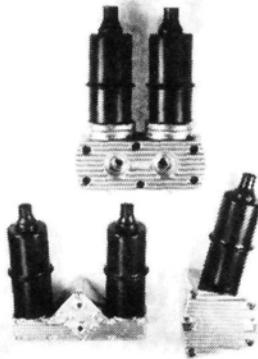
Seven pages of this issue of "Printed Circuit" highlighted a "structure test" carried out by Jim Dean of Cumberland, MD. Designed to gain new insights, you may find it interesting today. When your plans tell you, "Don't forget the spar webbing," do you wonder why?

Under laboratory conditions, Jim tested two spar structures (top and bottom), using webbing between the ribs—one with vertical-grain webbing and the other with horizontal grain. In both cases, the webbing was applied to the edges of the spars,

(Continued on page 122)

PRODUCT NEWS

Descriptions of new products appearing in these pages were derived from press releases by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News**, or guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Model Airplane News**.



J'TEC Giant Snuf Mufflers

J'Tec offers a complete line of Giant Snuf mufflers for all 1.3 to 5.7 engines, e.g., Quadra, Zenoah, Sachs-Dolmar, O.S. Max and Super Tigre. The mufflers consist of a specially designed aluminum manifold and one or two patented "Snuf-ler" mufflers. This combination greatly reduces engine noise with little or no power loss. They're easy to attach—just bolt them on. The mufflers are made in three styles to suit a variety of engines, and mounting bolts are available for each one.

Price: \$39.95 to \$59.95.

For more information, contact your hobby shop or J'TEC, 164 School St., Daly City, CA 94014.



ASTROFLIGHT The Porterfield Collegiate

The Porterfield Collegiate (model 1024) is a perfect sport-scale electric model that's great for beginners and easy to fly. You can enjoy 10-minute flights on one charge. It has a light wing loading for schoolyard flying; and it includes an Astro Cobalt 25

geared motor. Specifications: wing-span, 69 inches; length, 40 inches; area, 610 square inches; weight, 5 pounds. It requires two, 7-cell, 1200mA Ni-Cds and a 3- or 4-channel R/C system.

For more information, contact AstroFlight Inc., 13311 Beach Ave, Marina Del Rey, CA 90292.



A&S INDUSTRIES Hardware Kit

You're working on a model late at night, or you're in the field ready to fly, but an essential part is missing, and you're tired of paying high hobby-shop prices! A&S Industries' new Hardware Kit is for you! A&S has taken more than 500 of the most-used fasteners in more than 34 sizes and types and put them into a small, compartmented plastic container with a snap-shut lid. No more searching your garage or hobby shop for what you need. Just get out your Hardware Kit with its assortment of: 42 socket-head capscrews; 8 nylon wing bolts; 80 self-tapping machine screws; 55 aircraft locknuts; 44 three-prong blind-nuts; 85 flat washers; 125 split-lock washers; 85 nylon flat washers.

Bought individually at a hobby shop, these parts would cost about \$40, but the introductory price on this kit is only \$12.50, plus \$3 S&H. Satisfaction guaranteed or your money back.

For more information, contact A&S Industries, 222 N. Willow, P.O. 457, Mansfield, TX 76063.



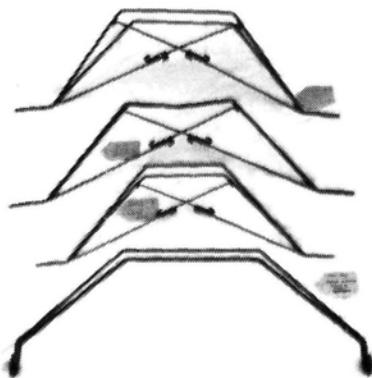
R/C WORLD VIDEO In-Flight Action Videotape

A new videotape is available for modelers who are interested in capturing in-flight action on tape or photographs. This videotape is a valuable tool, and it's also very entertaining. Hosted by professional R/C aerial photographers Adrian and High Kingsford, "R/C Airborne Video" is packed with information about equipment selection, camera placement, flying tips and amphibious operations. A fleet of camera-carrying aircraft is featured, with some conventional designs and some very interesting purpose-built craft.

The flying scenes are plentiful and fun to watch. There are some stunning cliff-top hand-launch and retrievals shots from the aircraft. Seaplane pilots will enjoy seeing water landings from the pilot's perspective, and there's also excellent soaring footage. This tape was filmed on New Zealand's rugged South Island and the aerial views are spectacular.

The Kingsfords' many years of experience in aerial video and still photography will help make your airborne video project a success. This well-produced program runs for 55 minutes and costs only \$14.95, plus \$4 for first-class S&H.

For more information, contact R/C World Video, 1403 Bayview Dr., Hermosa Beach, CA 90254.



BOB SHATTLEROE Custom Landing Gear

These spring-loaded gear are new additions to a line of gear and cabanes that are available for more than 70 giant-scale aircraft. The spring-style gear is very popular because it works. All the gear are wire-welded, reheated and made to fit T&D Fiberglass Specialties parts. Custom work is also done, and it often includes heavy-duty, giant-scale work and converting an existing gear design into a "spring-loaded" design. A catalogue is available for \$1, and with it, you'll receive a coupon good for \$1 off your order. Shown are the Concept Fleet Bipe, Sig Space-walker, Cunningham Lazy Ace and Stern's Liberty Sport B.

For more information, contact Bob Shattlereoe Custom Gear, 31985 John Hauk, Garden City, MI 48135.



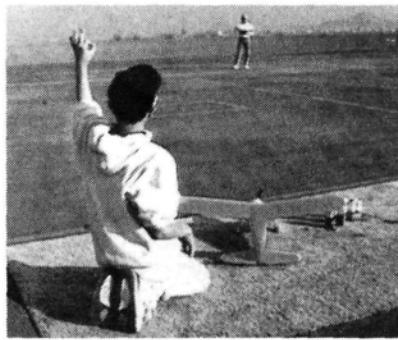
K&B Ducted-Fan Engine

The long-awaited K&B .82DF engine came on the market in July 1990. Designed as a universal ducted-fan engine to power various .80-class fan units, it has proven to be powerful and dependable. All the features of the popular K&B 7.5cc ducted-fan engine are in-

cluded: ABC piston and sleeve, hardened-steel crankshaft, connecting rod machined from high-tensile-strength bar-stock aluminum, K&B quintuple porting, steel rotor disc and K&B super ball bearings. An exhaust adapter is furnished for tuned pipe hook-up.

Price: \$325

For more information, contact K&B Mfg. Inc., Lake Havasu City, AZ 86403.

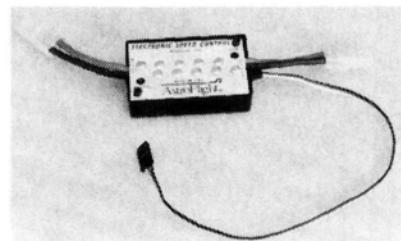


COX HOBBIES, INC. The Cox Video-Copilot™

The Video-Copilot™ is packed with everything new for the 1990 fuel- or electric-powered 2-channel aircraft, and it includes information on the new "user friendly" Cox Cobra 2-channel, single-stick system. Each Video-Copilot is appropriate for the particular aircraft, and it complements the fully illustrated assembly and flying instructions. It guides the new R/Cer through assembly, preflight checkout, starting the engine and setting the needle valve properly. Also included is a unique method of learning the correct hand-launching technique and all-important flight orientation procedures. Although the Video-Copilot isn't intended to replace the instructor pilot, it has enabled many new R/C pilots to successfully teach themselves.

Customers who have purchased an E-Z Bee 11, Cessna Skylane 11, Fairchild 24, or the Electric Sundance say that the Cox Video-Copilot is one of the most comprehensive, instructive tools offered with a hobby product.

For more information, contact Cox Hobbies, Inc., 350 West Rincon St., Corona, CA 91720.



ASTROFLIGHT 205 Hi-Rate Electronic Speed Controller

Astro's new model 205 Hi-Rate Electronic Speed Controller has the largest dynamic range available anywhere. It works efficiently with 6 to 32 cells and with 50W Ferrite 05 motors and 2000W Cobalt 60 FAI motors.

Five IRF-Z40 Mosfets, a special gate-drive circuit and a built-in aluminum heat sink give the 205 a peak rating of 700 amps and a 30-second rating of 100 amps.

Four IRF-Z30 Mosfets in the brake circuit have a peak rating of 500 amps and a 5-second rating of 100 amps. Opto-coupling eliminates any direct connection between the radio circuit and the motor circuit. Motor noise can't get into your radio receiver and cause glitching.

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AIRDROME

GOLDEN AGE

(Continued from page 1/6)

not put between them.

The test results led to a number of conclusions, but the outstanding finding was that breakage occurred when the vertical-grain webbed spar had only two-thirds of

the load supported by the horizontal web, i.e., the horizontal web supported one third more than the vertical one. This was surprising, because it contradicted what many preached as fact!

Despite the test results, vertical webbing was recommended, because experi-

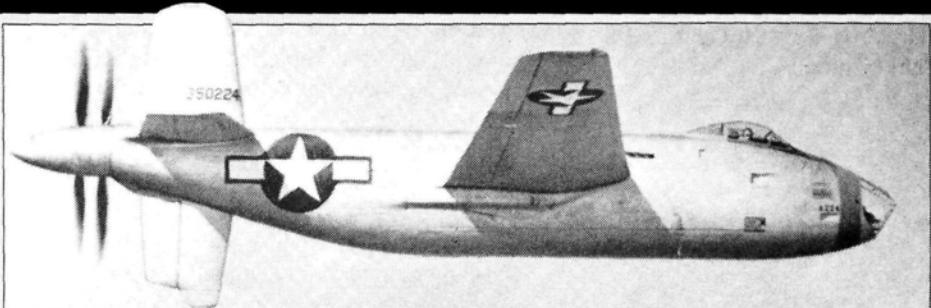
ence had shown that horizontal webbing was more likely to warp as the doped silk aged. (Doped silk is rarely used today.)

I'll add information gained through experience: inserting horizontal-grain webs between the spars and ribs to form an I-beam has proved to be outstandingly

NAME THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If so, send your answer to Model Airplane News, **Name the Plane Contest** (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.



Congratulations to Wil Heffelfinger of Lansford, PA, for correctly identifying the British Miles M.100 Student in our October issue. Wil is one of several observant readers who noted that we had used this plane once before (in June '88). You guys always keep us on our toes!

The Student was a private-venture, two-place jet trainer with a single engine mounted in the upper fuselage. It first flew on May 14, 1957. With a 32-foot, 6-inch wingspan and a Viper engine, its estimated performance was 418mph at sea level. It had a 392mph cruising speed at 20,000 feet and a rate of climb from sea level of 3,440 feet

per minute. The plane's operational range at 20,000 feet was 753 miles with no reserve. When empty, it weighed 4,282 pounds, and its gross weight was 7,300 pounds for a wing loading of 40 pounds per square foot. Provisions were made to carry the machine guns, bombs and rockets used in weapons training and ground-support roles.

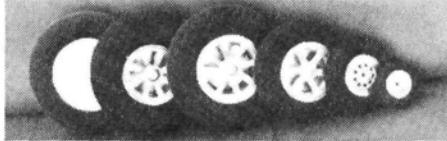
Although it was designed as a two-place trainer, the Student could be easily converted into a four-place design for fast communications or sport/executive aircraft roles.



The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to **Model Airplane News**. If already a subscriber, the winner will receive a free one-year extension of his subscription.

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SCRATCH-BUILDING

(Continued from page 90)

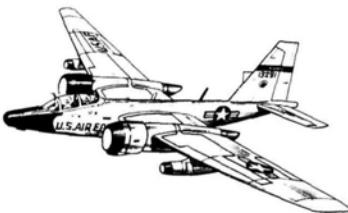
vide this by 36, and your answer is 6.6 pieces of 2-inch-wide balsa. If you carefully position the ribs on the sheet, you'll probably get by with only four sheets of 3-inch-wide balsa.

When you've made a list of materials, list the accessories you need: pushrods, wheels, hinges, fuel tank, wheel collars, motor mount, covering material, etc.

ASSEMBLY

Assembling a scratch-built model is no different from building one from a kit, and the same rules apply: *follow the directions*. The plans sold by *Model Airplane News* are identified by number, e.g., the deHavilland DH-2 is plan no. FSP05762. This means that the construction article that goes with it was published in the May '76 issue. You'll need to refer to the con-

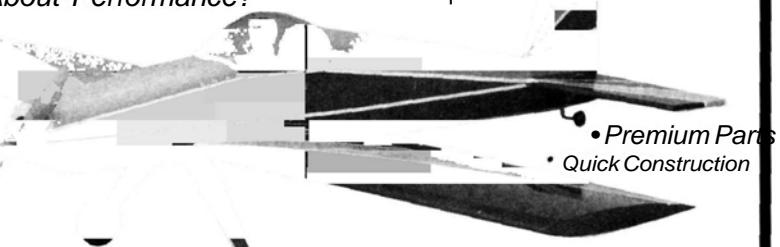
(Continued on page 125)



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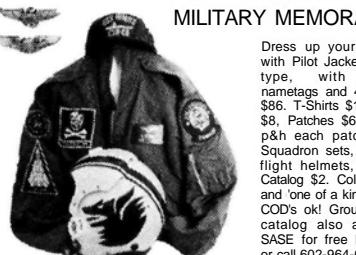
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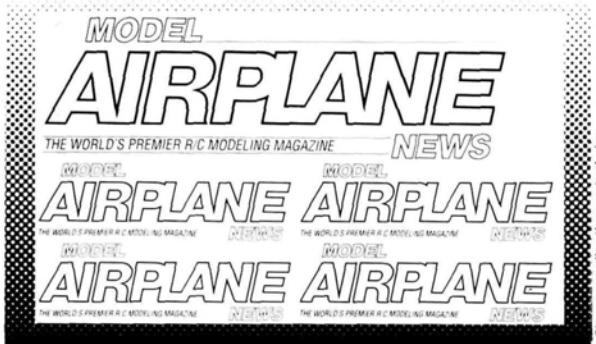
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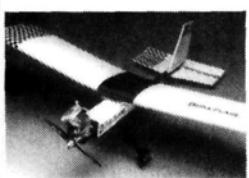
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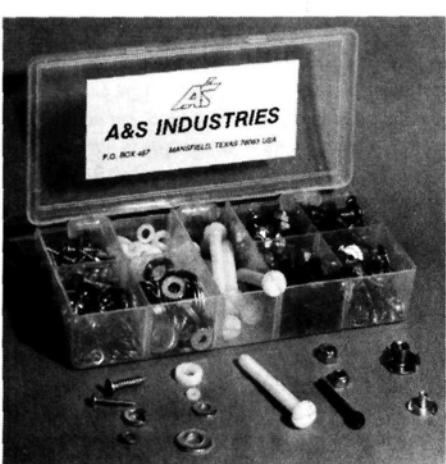


Duracraft, Inc.
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CLUB

OF THE MONTH



DIABLO VALLEY R/CERS

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Boy, the members of Model Airplane News? "Club of the Month" sure are excited! The Diablo Valley Radio Controllers (of Walnut Creek, CA) just bought a new flying field, and they can't wait to use it. The club's newsletter, "Pattern Patter," is full of details about the purchase and the fixing-up process.

Phone calls about the new field may be "fast and furious," but the project progressed rather slowly. Getting the culvert pipe delivered was a major hassle. The club also ran into competitive-bidding problems with Redwood City, but 40,000 square feet of prime AstroTurf should be rolling in any day now—from the San Francisco 49ers, no less! I wonder if some of the World Champion football team's magic will rub off, and club members will suddenly be flying fantastic turns and rolls like never before! (I guess after all the "hot, dusty, back-breaking work" they've done, the members wanted low-maintenance grass!)

Suppliers may not have "come through as promised" on the new field, but club member Ken Mountain had a reassuring experience with the people at Duracraft. The company claims its planes are indestructible, but Ken managed to do major damage to his—he dug a deep hole with it, in fact, and ruined the engine! The cause?—maybe the fact that the plane had *double* the recommended control throws and was overpowered! (It's designed for a .30 engine; Ken used an O.S. 46F!) Anyway, Ken called the folks at Duracraft and, in exchange for a photo of the wrecked plane, he received a brand-new DuraBat—free!

If only the new field were that cheap, right?! It doesn't have a clubhouse (yet), or water, but it's bound to be the best field in the region. The club's old-timers are feeling a little nostalgic, though. As the editor headed to "tear down" Lindsey Field, he passed the old Stoneman runway and saw that it, too, had been torn up and graded. A few dozen members regularly took off from that concrete strip in the 70s.

For all their hard work and enthusiasm, we name the Diablo Valley R/Cers MAN'S "Club of the Month." Enjoy your free subscriptions, and take care of that field!

SCRATCH-BUILDING

(Continued from page 123)

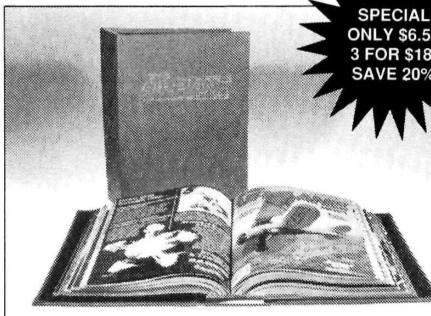
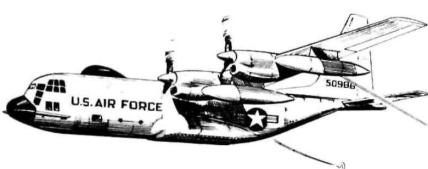
struction article, so when you order a set of plans, order the corresponding issue of *MAN*. The construction article will answer most of your questions about the design and how you should build it.

Because the weight and grain of balsa wood vary, pieces differ in their ability to bend. For this reason, when you glue the two sides to the bulkheads and then glue the tail-post pieces together, you'll often find that one side seems longer than the other. (When you glue parts together over the plans, protect the plans with a sheet of wax paper.) Obviously, it isn't, because you checked that—remember? Assemble the fuselage sides either in a jig or over a center line on the plans. (That's why the top view is shown.)

Follow the logical steps that apply to most models. For an airplane to fly properly, it must be aligned about the vertical and horizontal center lines. For good axial balance and good roll characteristics, the wing panels should weigh the same.

When you assemble the fuselage sides, make sure that the bulkheads are perpendicular to the horizontal center line. If they aren't, the sides won't have equal curvature, and their aerodynamics will differ. Similarly, if the fuselage isn't straight,

(Continued on page 127)



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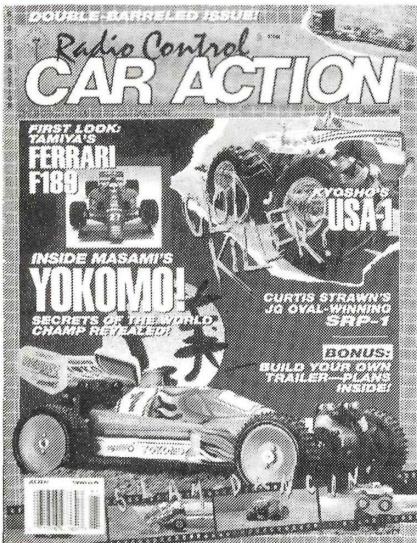
SCRATCH-BUILDING

(Continued from page 125)

your engine thrust line and the vertical stabilizer will be "off." There's no way to correct this situation, so get it right the first time.

When you've built the fuselage, assemble the stabilizer parts, but don't glue them into place. Set the fuselage on a flat surface and put the stab and wing into position. Measure the height of each wing tip from the building surface. If the heights differ, trim the fuselage wing saddle down on the high side until the

(Continued on page 129)



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SCRATCH-BUILDING

(Continued from page 127)

heights are equal. Make sure that the tips of the horizontal stab are both the same height from the building surface and that the stab is parallel to the wing.

Now align everything from above. Mount your wing, making sure it's centered, then position your horizontal stab. Measure from the trailing edge of the wing to the rear of the stab where the elevator is attached. The sides of the horizontal stab should both be the same distance from the wing, and the wing tips should be the same distance from the fin's leading edge. When they are, pin them into place. Now pin the vertical stabilizer into place, and sight down the front of the airplane. If all you can see is the leading edge, great! Use a triangle to make sure that the vertical stabilizer is square to the horizontal stab.

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